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AGRICULTURAL SPECTRAL SIGNATURES

YUMA TEST SITE

MISSION 91-14

MARCH 20-21, 1974

Dr. R.H. GRIFFIN, II

REPORT NO. 109

APRIL 8, 1974

LYNDON B. JOHNSON SPACE CENTER

INTRODUCTION

Basic to agricultural remote sensing applications is the study of crop signatures in the field at various growth stages and under various growing conditions.

A crop signature study is being conducted by the Earth Resources Laboratory at the University of Arizona Agricultural Experiment Station, Yuma, Arizona.

The purpose of the study is to determine areas of the spectrum and crop growth stages that would allow for the greatest probability of indentification of each specific crop.

A layout of the Experiment Station is presented in Figure 1. The present study is being conducted in fields C-4 through C-14, identified in the figure as the "Signature Study" and the "Alkaloid Field Study".

The detailed plot plan for the spectral signature study is given in Figure 2. The numbers in the lower portion of each plot will be used throughout the study to reference the individual plots. Plots 7-11, 18-22, 24-33, and 40-44 were planted in February and March, 1974.

Figure 3 presents details of the alkaloid yield study area. Data points are indicated by the numbers 51-55 which will be used throughout the study to reference the individual plots. Due to the layout of the study, data cannot be obtained from treatment number 2.

Spectral data was taken with an Exotech model E20D filterwheel spectrometer mounted on a truck-boom 20 feet above the ground (Fig. 4 & 5). Three detectors were available; 1) Silicon (Si) with a wavelength range of 490-1290 nanometers was used at every field data point; 2) Lead Sulfide

(PbS) with a wavelength range of 900-1300 nanometers will be used at selected field data points; 3) Mercury-Cadmium-Telluride (HgCdTe) with a wavelength range of 4100-14400 nanometers will be used during the latter part of the study on selected field data points after calibration of the detector is completed.

A Hasselblad model 500 El with 80mm lens was mounted on the truck boom (Fig. 5) parallel to the spectrometer in order to photograph the spectrometer target. The spectrometer footprint was drawn on each photograph and vegetation ground cover percentage determined.

Incoming radiation was measured with an Eppley Pyranometer and recorded for each day that spectrometer data was taken (Fig. 6). Air temperature and relative humidity were recorded at two and five feet above the ground. Table 1 contains data taken at 1 hour intervals from 7 am to 6 pm on the days when spectrometer measurements were made.

Ground level photographs were taken of each sampling point along with observations on height, growth stage, and general crop conditions.

Spectral signatures from the Si and PbS detectors were obtained by ratioing the target reflectance against the incoming radiation to give percentage reflectance. The HgCdTe detector data will be presented as apparent temperature.

This is one of a series of data reports; each will contain the data collected at the Yuma, Arizona test site since issuance of the previous report. A final analysis and summary will be issued after the study is completed.

Data was collected March 20-21, 1974 from the following targets: cabbage, broccoli, onions, poppy - 1, poppy - 3, bare ground, cauliflower, carrot, chick peas, poppy - 2, poppy - 4 and poppy - 6.

FIELD NUMBERING SYSTEM

UNIVERSITY OF ARIZONA - YUMA VALLEY EXPERIMENT STATION

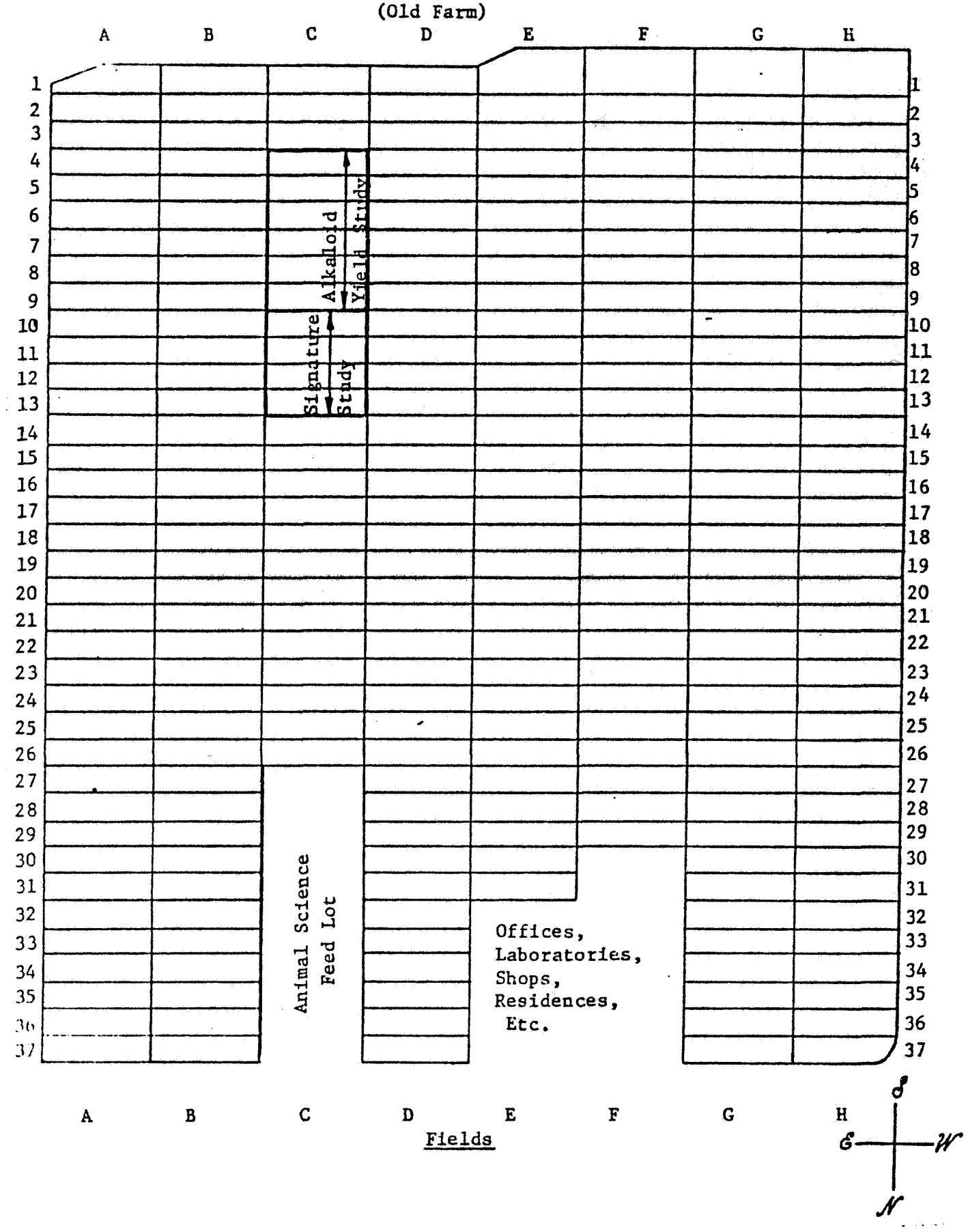
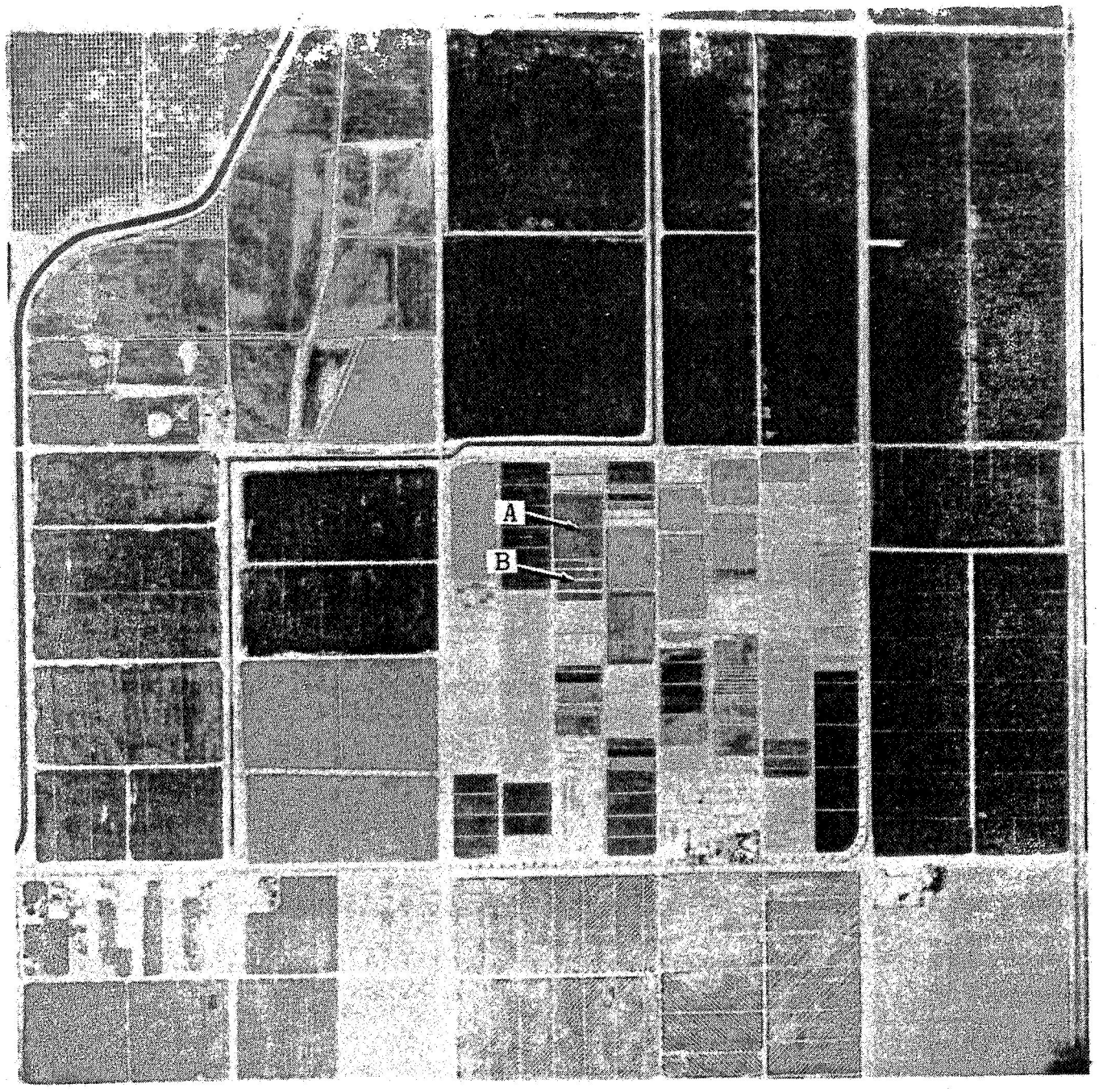


Figure 1 STATION PLAN



UNIVERSITY OF ARIZONA AGRICULTURAL EXPERIMENT STATION, YUMA, ARIZONA

February 17, 1974, Altitude 5000 ft., K-17 Camera (6" focal length lens)

A- ALKALOID YIELD STUDY
B- SPECTRAL SIGNATURE STUDY

FIGURE 1A

Spectral Signature Study
USDA, NASA, Lockheed and U of A Cooperating
Yuma, Ariz, 1973-74
Field C, Border 10-13

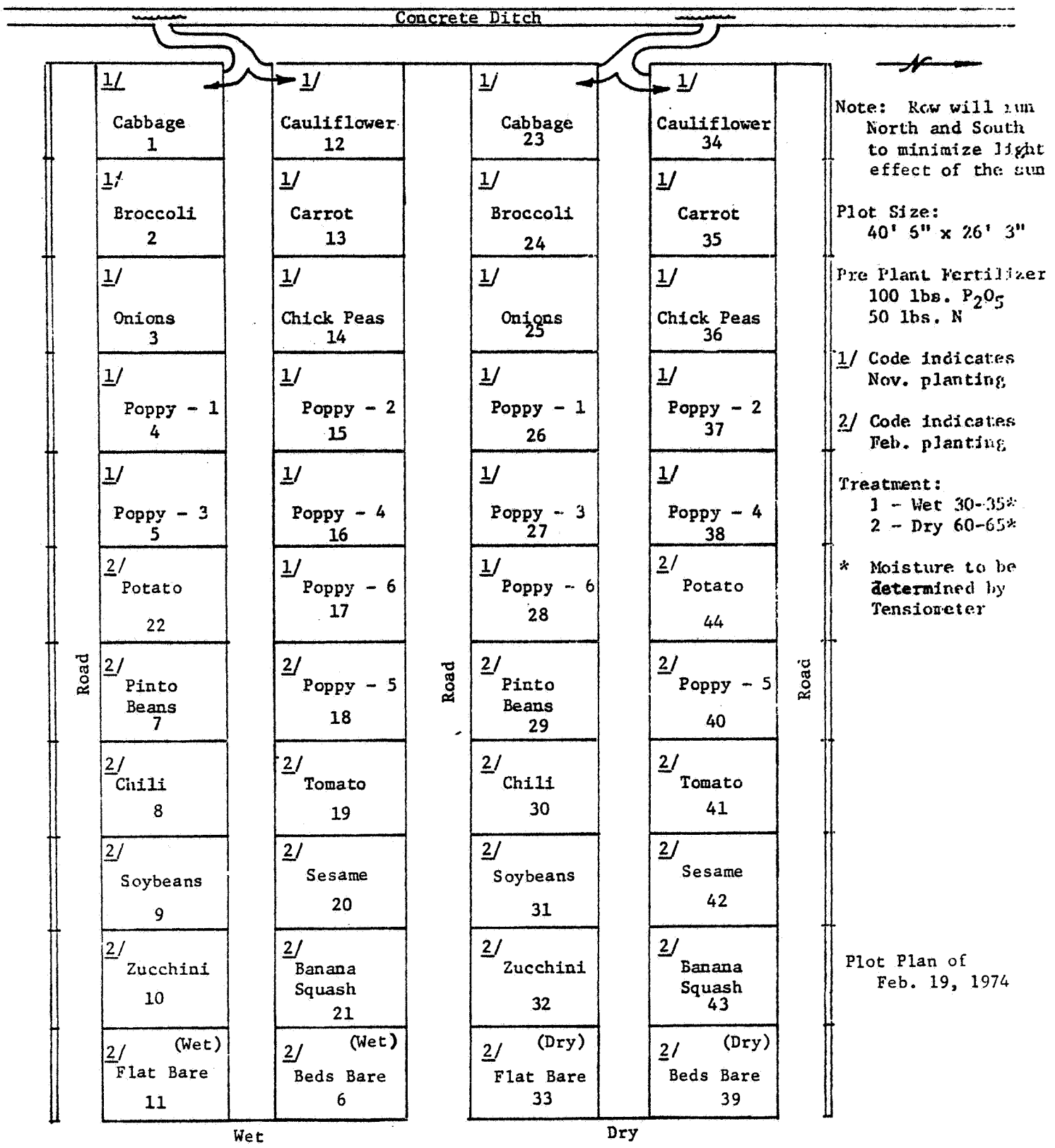
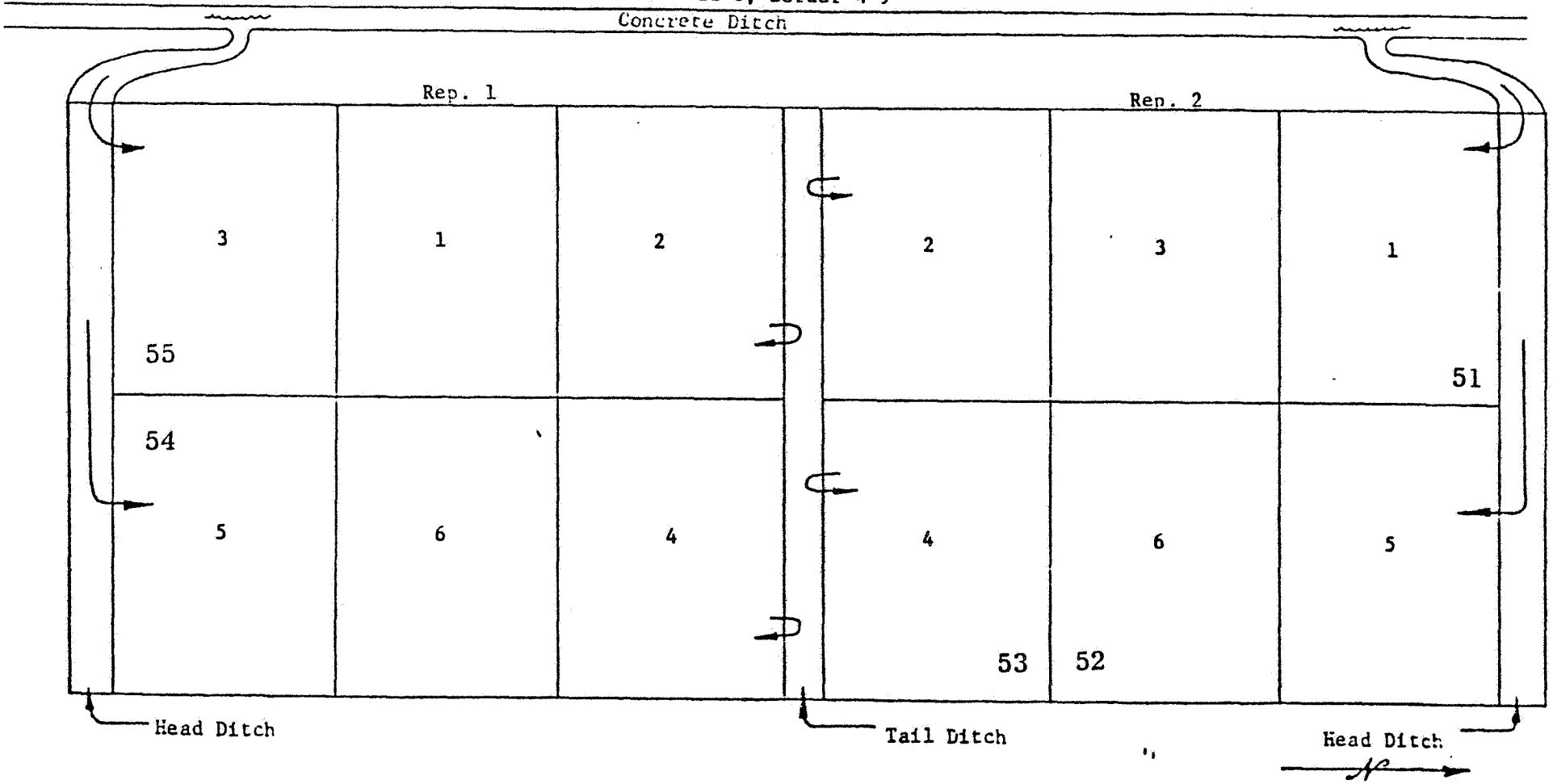


Figure 2 SIGNATURE STUDY PLAN

POPPY
Alkaloid Yield Study
USDA, U of A Cooperating
Field C, Border 4-9



DATA POINT	TREATMENT IDENTIFICATION
51	1. Variety 1 6 cm spacing
	2. Variety 1 12 cm spacing
55	3. Variety 1 18 cm spacing
53	4. Variety 2 6 cm spacing
54	5. Variety 2 12 cm spacing
52	6. Variety 2 18 cm spacing

Note: Rows will run North and South to minimize light effect of the sun.
Plot Size: 140' x 60'
Pre Plant Fertilizer: 100 lbs P_2O_5 50 lbs N
Planting Date: November 7, 1973.
Germination Irrigation: November 8, 1973

Figure 3 ALKALOID YIELD STUDY PLAN

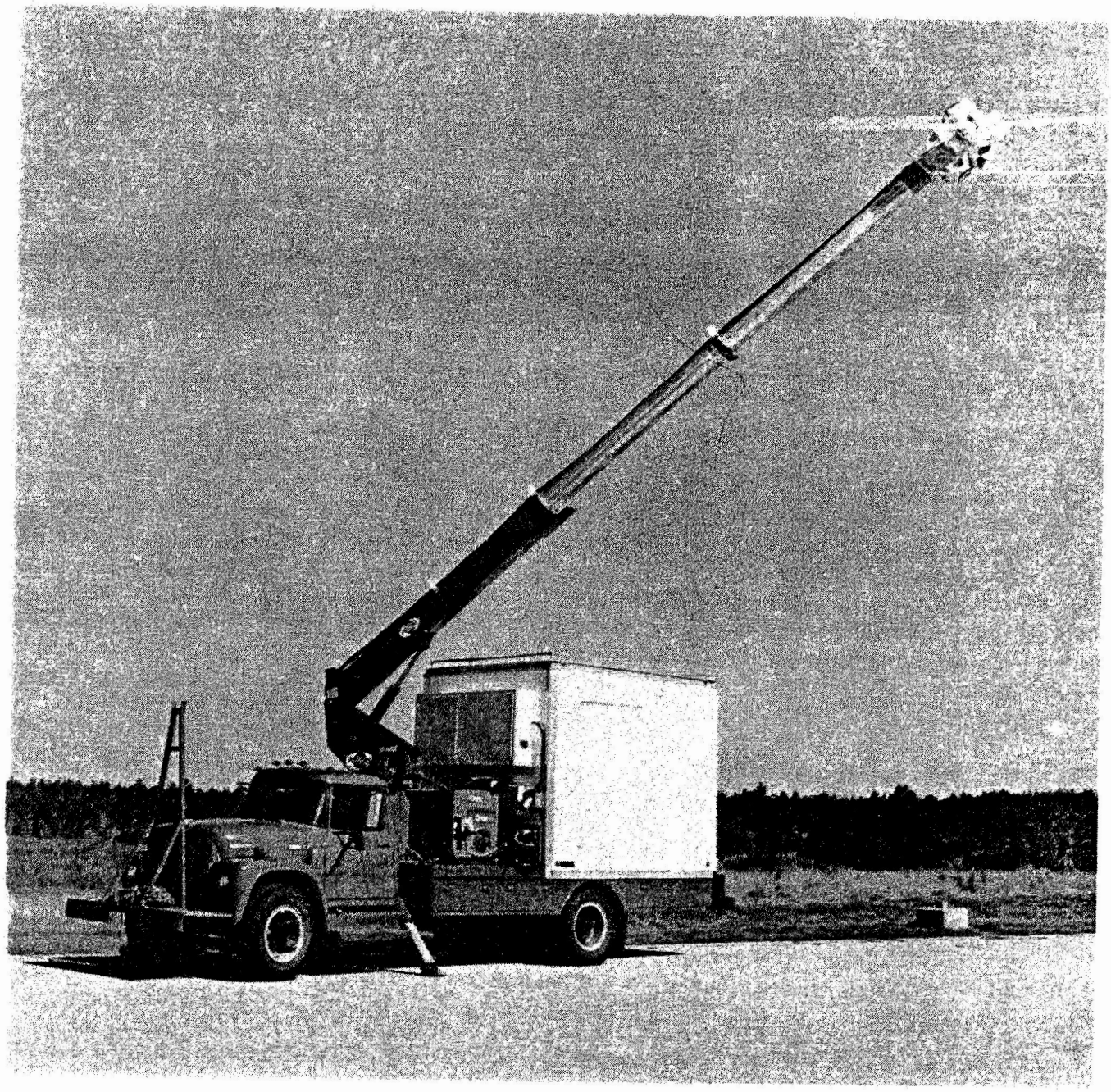


Figure 4 ERL REMOTE SENSING INSTRUMENTED VAN

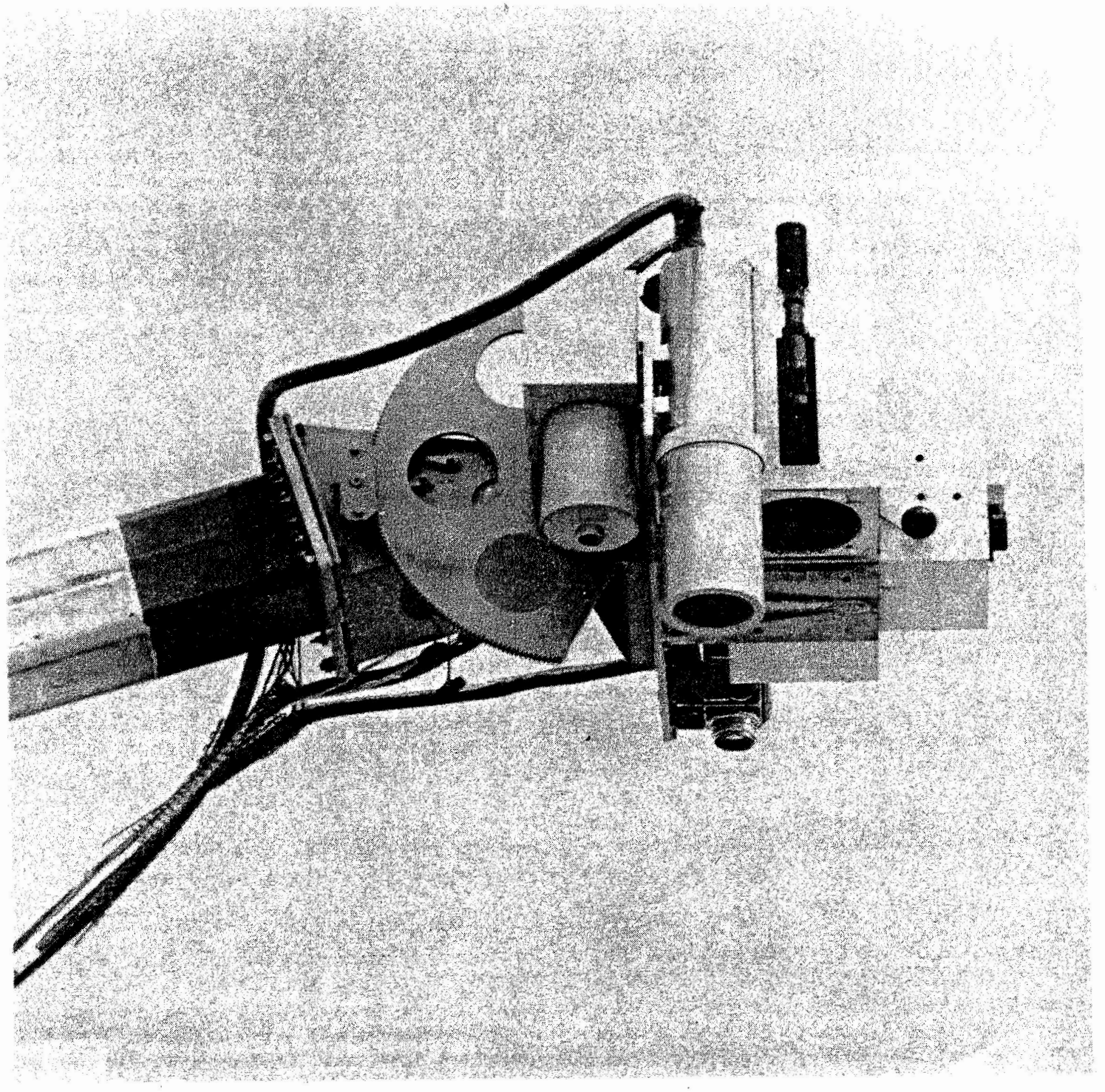


Figure 5 TRUCK BOOM MOUNTED SENSOR SYSTEM

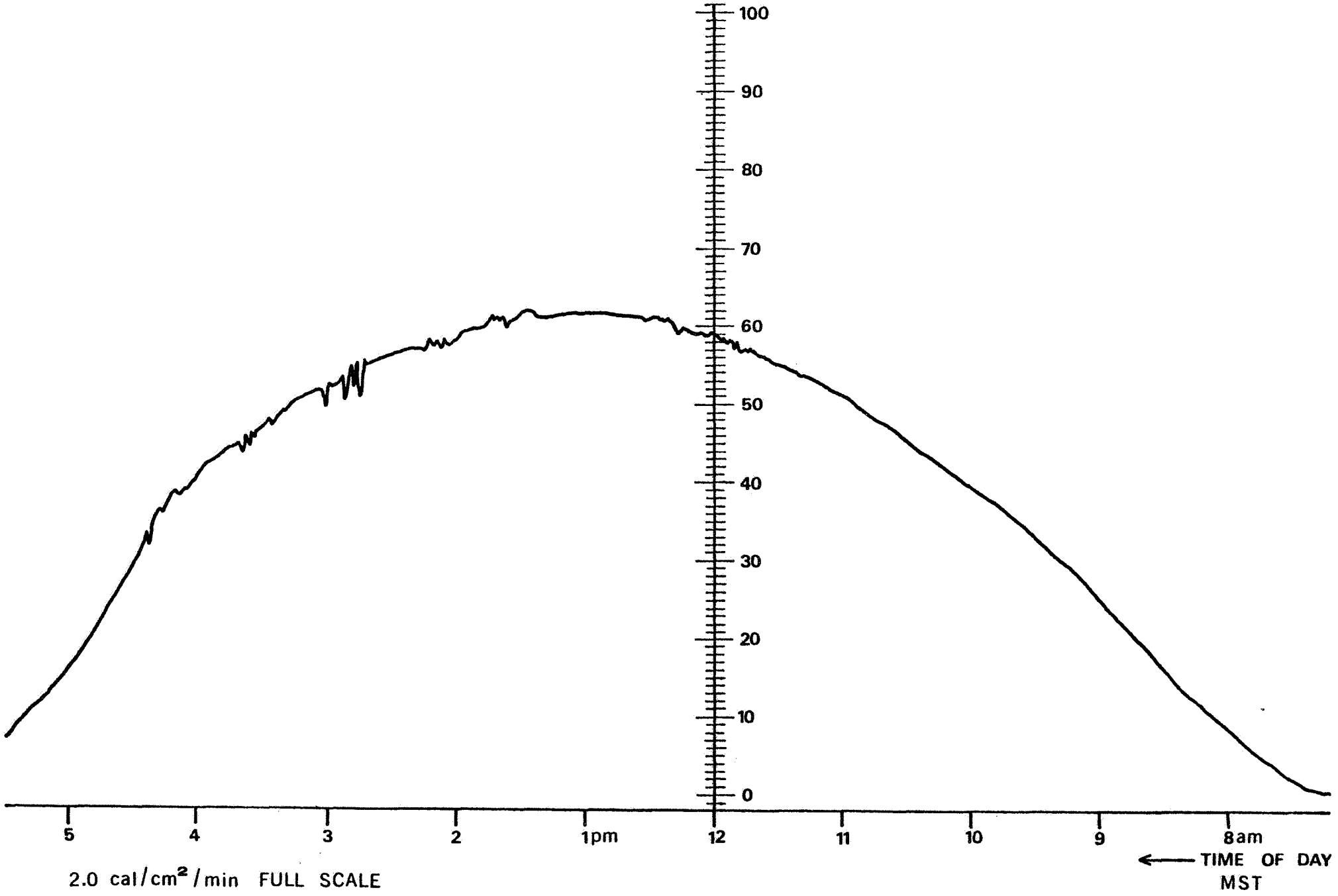


Figure 6 PYRANOMETER CURVE

Table 1 RELATIVE HUMIDITY and TEMPERATURE

MARCH 21, 1974

TIME	2 FEET		5 FEET	
MST	R.H. %	TEMP. °F	R.H. %	TEMP. °F
7 am	99	47	90	46
8 am	95	52	72	52
9 am	69	62	62	60
10 am	60	66	57	62
11 am	53	70	50	64
12 am	49	72	47	67
1 pm	47	74	45	68
2 pm	42	75	41	70
3 pm	46	75	42	72
4 pm	50	73	44	70
5 pm	50	72	46	71
6 pm	64	68	56	68

PLOT DETAILS

THIS SECTION CONTAINS FOR EACH PLOT THE FOLLOWING DETAILS:

- CROP HISTORY
- GROUND LEVEL PHOTO
- BORESIGHT PHOTO
- GROUND TRUTH DATA
- SPECTROMETER CURVE

PLOT NO. 1 CABBAGE

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing
Nov 9, 1973	Irrigated
Nov 12, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 12"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/ Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

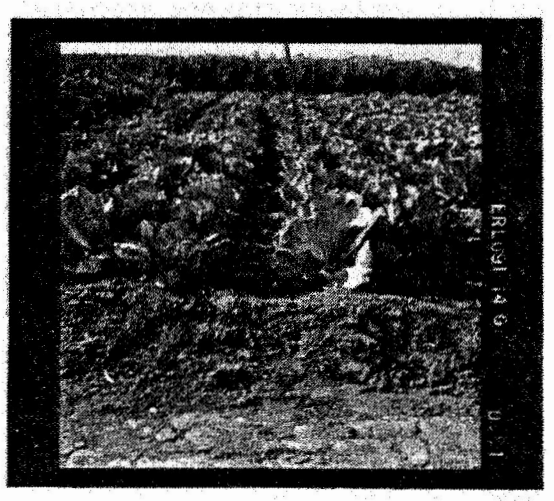
PLOT NO. 1 CABBAGE

GROUND TRUTH DATA

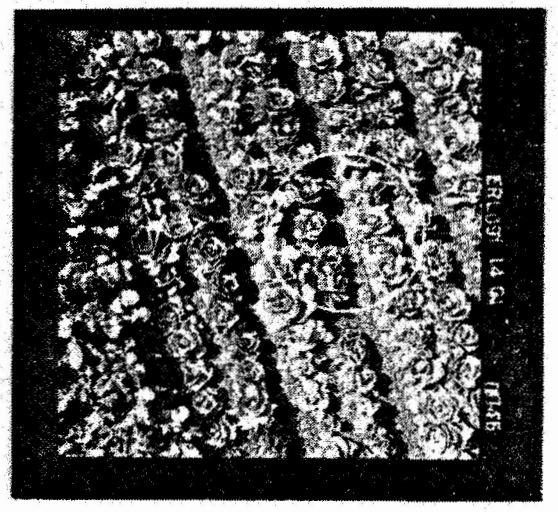
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 12, 1973	2	5	Moist	Normal	-
Dec 18, 1973	2.5	2	Dry	Thinning - shock slightly wilted	Thinned Dec 17, 1973
Jan 3, 1974	4	5	Moist 1.5" down	Cold-wilted	-
Jan 10, 1974	5	17	Moist .5" down	Normal	-
Jan 14, 1974	5	20	Wet	Normal	-
Jan 25, 1974	6	25	Moist 1" down	Normal	5% weeds - salt on rows Jan 21, 1974
Jan 30, 1974	7	25	Moist 2" down	Normal	-
Feb 7, 1974	9	25	Wet	Normal	Irrigated Feb 4, No weeds
Feb 14, 1974	10	27	Moist 1" down	Normal	-
Feb 22, 1974	10	28	-	Normal	-
Feb 28, 1974	10	30	-	Normal	-
Mar 8, 1974	10	31	Moist	Normal	-
Mar 13, 1974	11	33	Moist	Normal	-
Mar 20, 1974	12	35	Moist	Normal	-

PLOT NO. 1 CABBAGE

MARCH 20, 1974



GROUND LEVEL

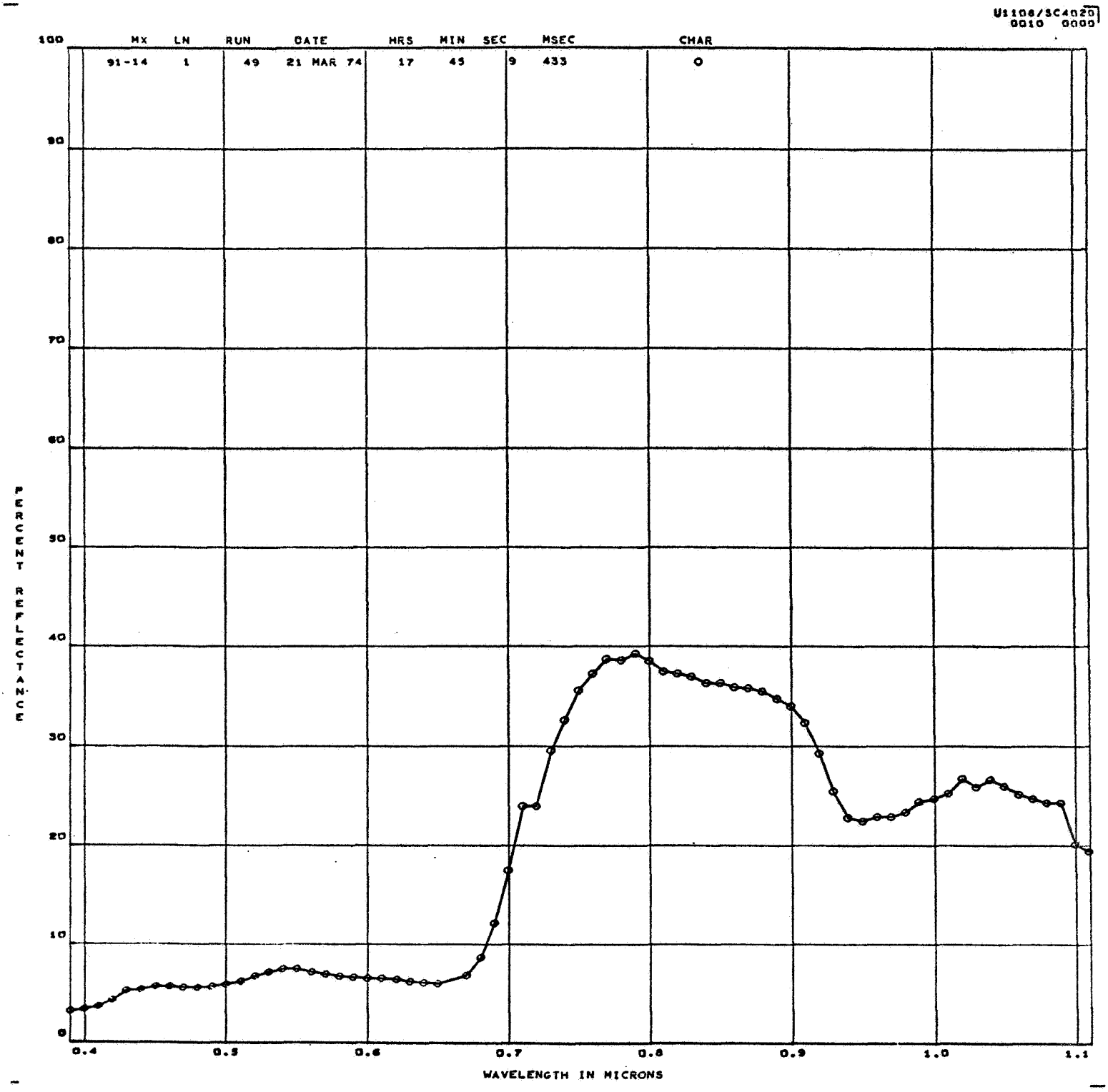


BORESIGHT

Circle represents spectrometer signature

PLOT NO. 1 CABBAGE

SPECTROMETER SIGNATURE



PLOT NO. 2 BROCCOLI

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing
Nov 9, 1973	Irrigated
Nov 12, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 14"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

PLOT NO. 2 BROCCOLI

GROUND TRUTH DATA

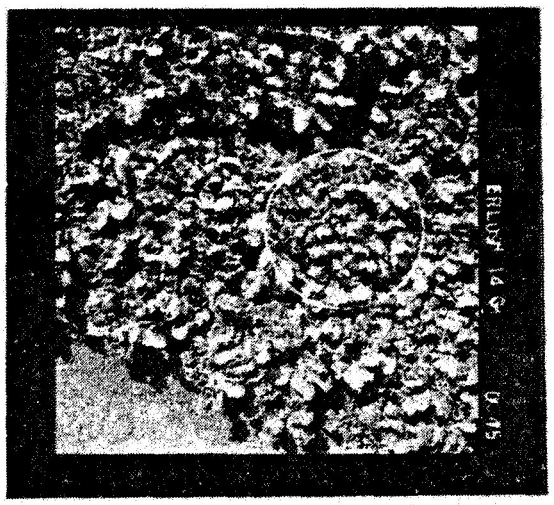
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
ec 12, 1973	2	5	Moist	Normal	-
ec 18, 1973	2.5	2	Moist 1" down	Thinning-shock slightly wilted	Thinned Dec 17, 1973
an 3, 1974	4	5	Moist 1.5" down	Cold-wilted	-
an 10, 1974	5	15	Moist .5" down	Normal	-
an 14, 1974	6	18	Wet	Normal	-
an 25, 1974	8	22	Moist 1" down	Normal	Tens. =20, salt on row Jan 21, 1974
an 30, 1974	9	24	Moist 2" down	Normal	-
eb 7, 1974	10	30	Wet	Normal	Irrigated Feb 4, No weeds. Tens. =30
eb 14, 1974	12	31	Moist 1" down	Normal	-
eb 22, 1974	14	38	-	Normal	Tens. = 20 on Feb 15, 36 Feb 19, 50 Feb 20
eb 28, 1974	17	39	-	Normal	-
ar 8, 1974	19	45	Moist	Normal	-
ar 13, 1974	24	60	Moist	Normal	Tens. = 20 on Feb 28, 59 Mar 4, 79 Mar 6, 52 Mar 13, 61 Mar 15
r 20, 1974	-	70	Moist	Normal	Beginning to head

PLOT NO. 2

BROCCOLI

MARCH 20, 1974

GROUND LEVEL



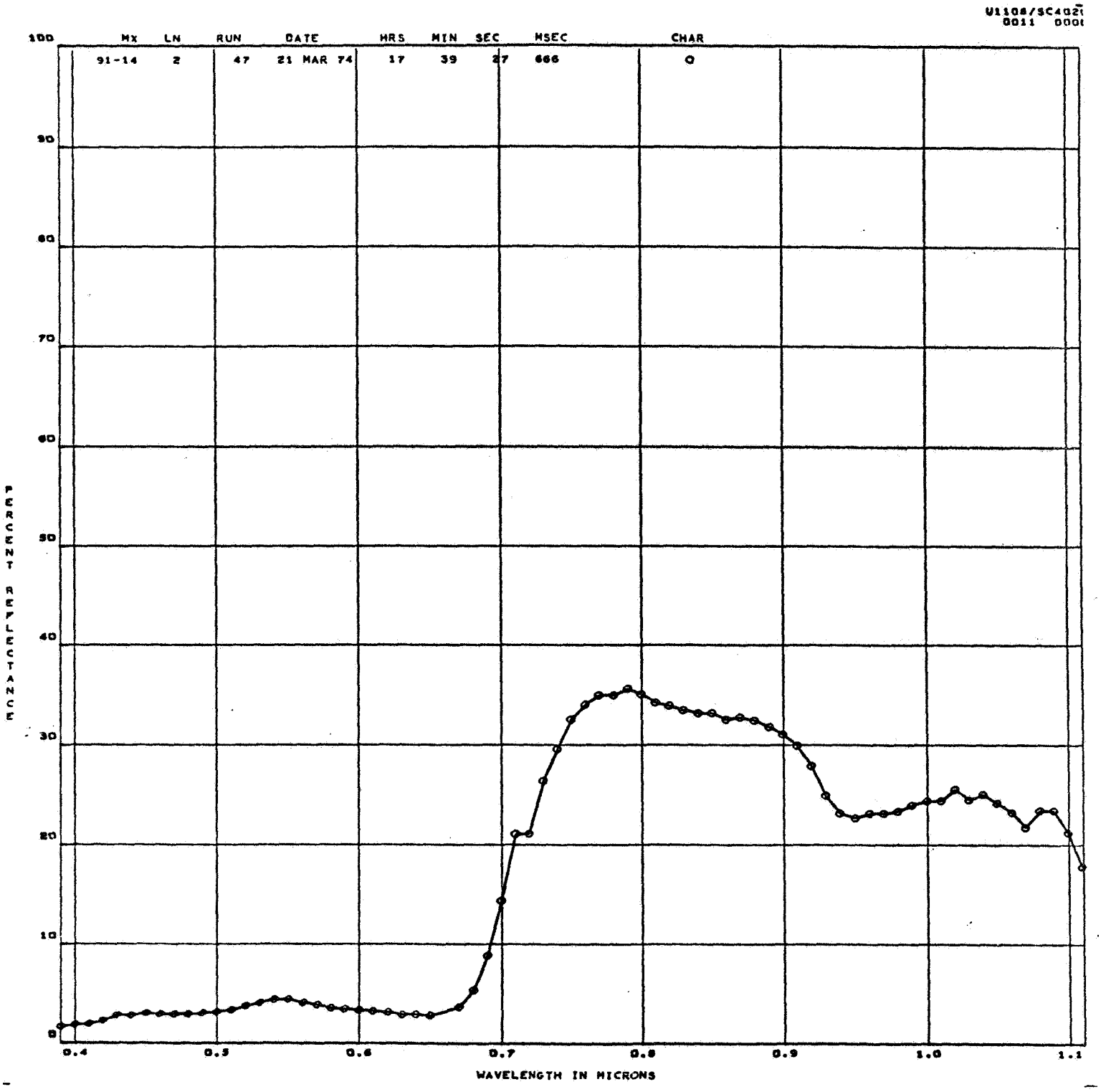
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 2

BROCCOLI

SPECTROMETER SIGNATURE



PLOT NO. 3 ONIONS

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 4 rows on 40" beds with 4-8-4" spacing
Nov 9, 1973	Irrigated
Nov 21, 1973	Irrigated
Nov 26, 1973	First emergence
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Hand weeded - Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

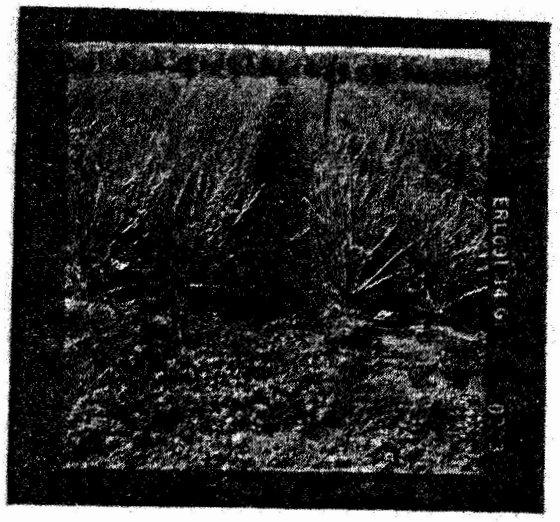
PLOT NO. 3 ONIONS

GROUND TRUTH DATA

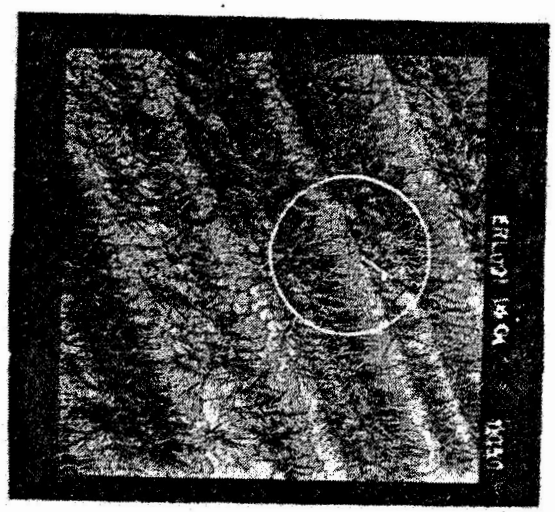
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 12, 1973	-	1	Moist	Normal	-
Dec 18, 1973	.5	1	Moist 1" down	Wilted	-
Jan 3, 1974	3.5	2	Moist 1.5" down	Cold-wilt	-
Jan 10, 1974	3	10	Moist .5" down	Normal	-
Jan 14, 1974	4	8	Wet	Normal	Weeded - Thinned Jan 14, 1974
Jan 25, 1974	6	15	Moist 1" down	Normal	Salt on rows Jan 21, 1974
Jan 30, 1974	7	15	Moist 2" down	Normal	-
Feb 7, 1974	8	17	Wet	Normal	Irrigated Feb 4, No weeds
Feb 14, 1974	8	17	Moist 1" down	Normal	-
Feb 22, 1974	10	18	-	Normal	-
Feb 28, 1974	13	25	-	Normal	-
Mar 8, 1974	14	25	Moist	Normal	-
Mar 13, 1974	15	27	Moist	Normal	-
Mar 20, 1974	19	30	Moist	Normal	-

PLOT NO. 3 ONIONS

MARCH 20, 1974



GROUND LEVEL



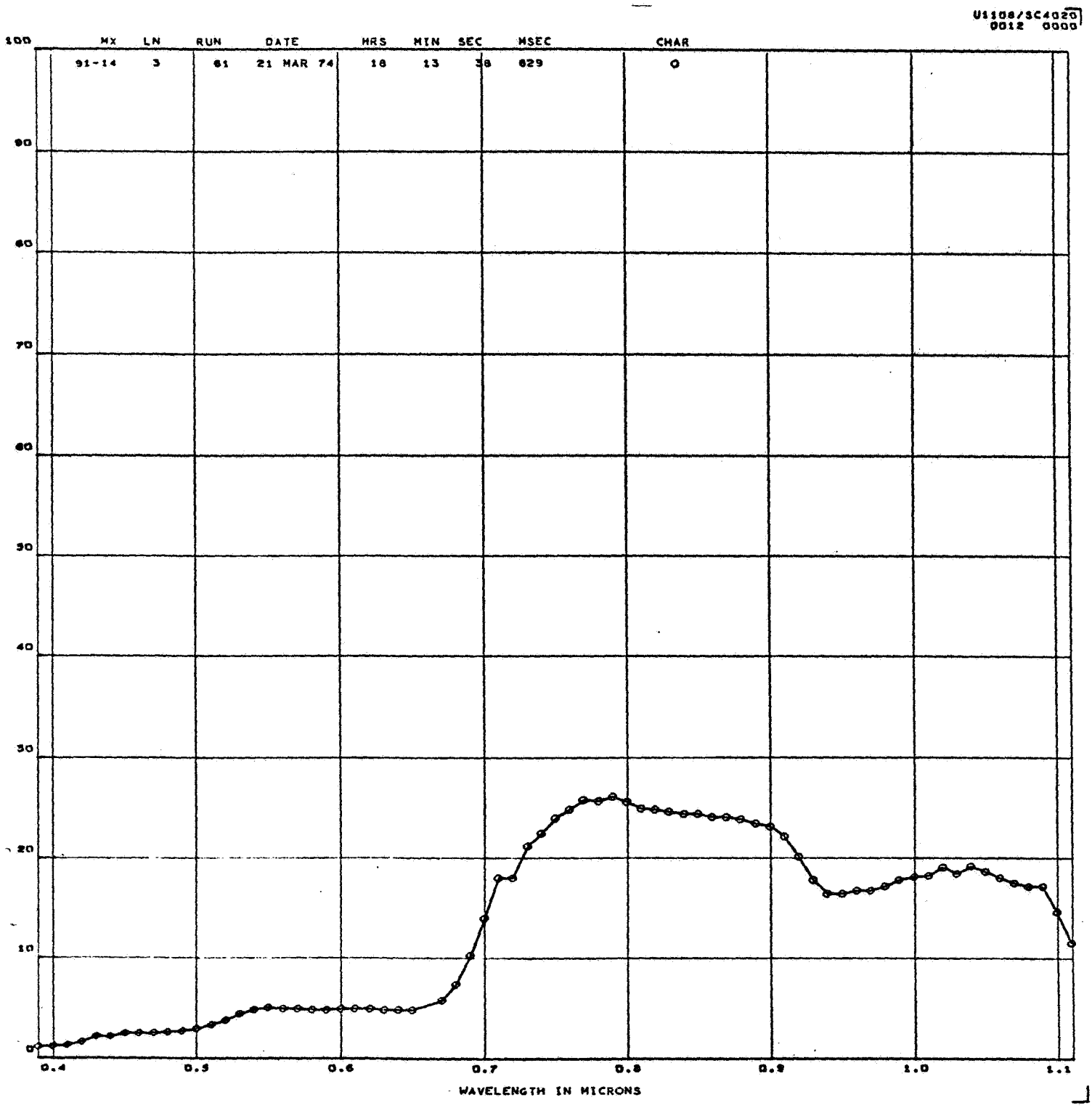
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 3

ONIONS

SPECTROMETER SIGNATURE



PLOT NO. 4

POPPY-1
(Acquisition No. B-40-6-3)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing and 9" between plants in drill
Nov 9, 1973	Irrigated
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 9"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

PLOT NO. 4

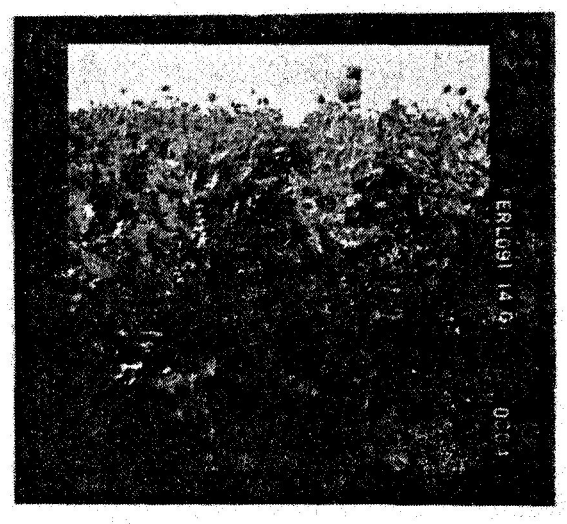
POPPY-1
(Acquisition No. B-40-6-3)

GROUND TRUTH DATA

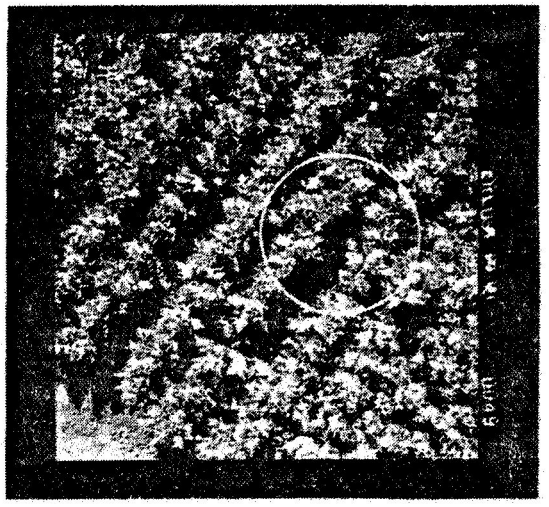
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	.5	1	Moist 1" down	Wilted	Thinned Dec 17
Jan 3, 1974	1.5	5	Moist 1.5" down	-	-
Jan 10, 1974	2	12	Moist .5" down	Normal	-
Jan 14, 1974	3	22	Wet	Normal	-
Jan 25, 1974	5	27	Moist 1" down	Normal	Salt on rows Jan 21, 1974
Jan 30, 1974	7	27	Moist 2" down	Normal	-
Feb 7, 1974	10	30	Wet	Normal	No weeds
Feb 14, 1974	13	40	Moist 1" down	Normal	-
Feb 22, 1974	16	49	-	Normal	-
Feb 28, 1974	20	71	-	Normal	-
Mar 8, 1974	26	75	Moist	Normal	-
Mar 13, 1974	38	85	Moist	Normal	-
Mar 20, 1974	45	95	Moist	Normal	Many purple blossoms

PLOT NO. 4 POPPY-1

MARCH 20, 1974



GROUND LEVEL



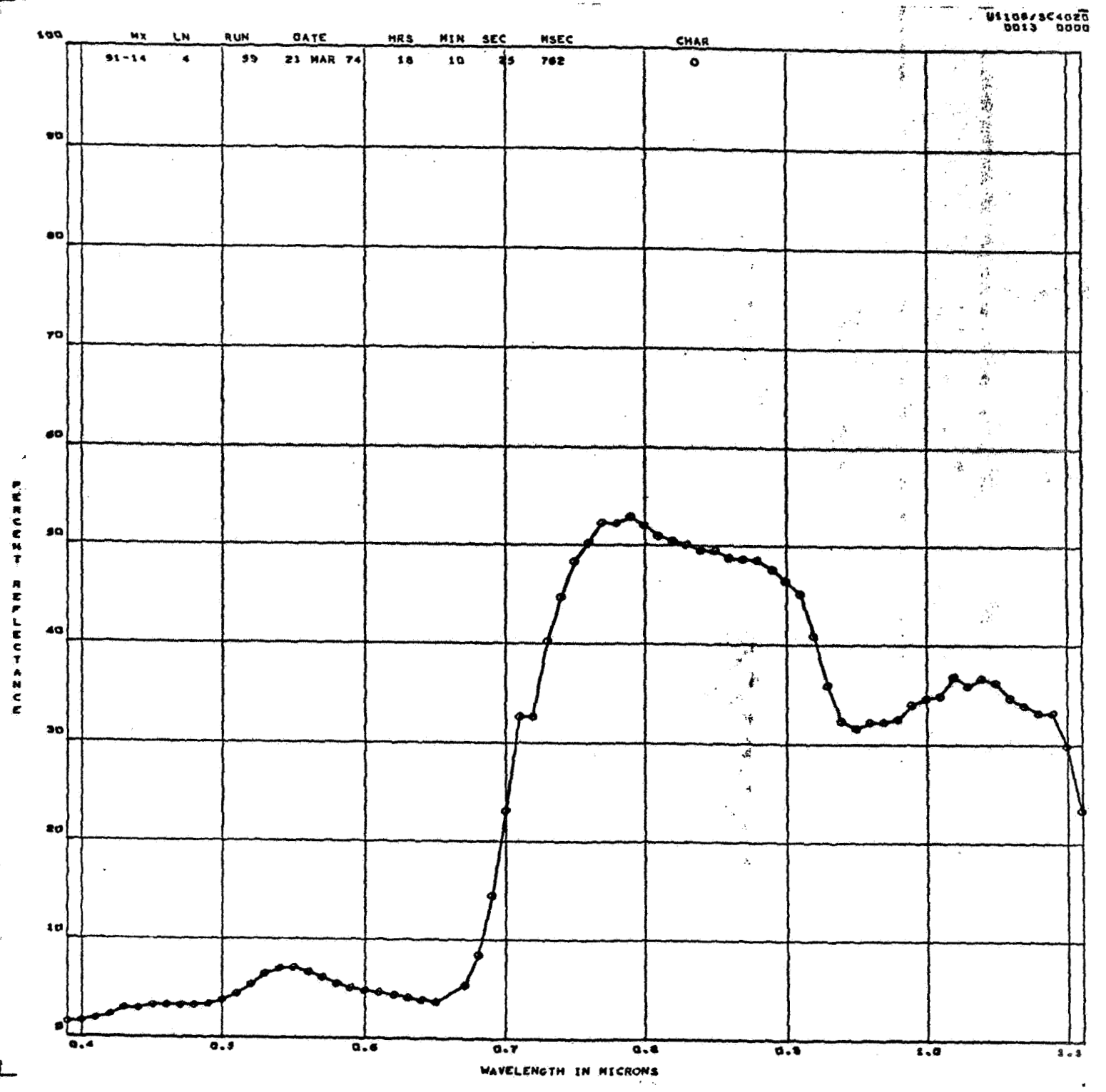
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 4

POPPY-1

SPECTROMETER SIGNATURE



PLOT NO. 5

POPPY-3
(Acquisition No. 371923)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40' beds with 12" spacing and 9" between plants in drill
Nov 9, 1973	Irrigated
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 9"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

PLOT NO. 5

POPPY-3
(Acquisition No. 371923)

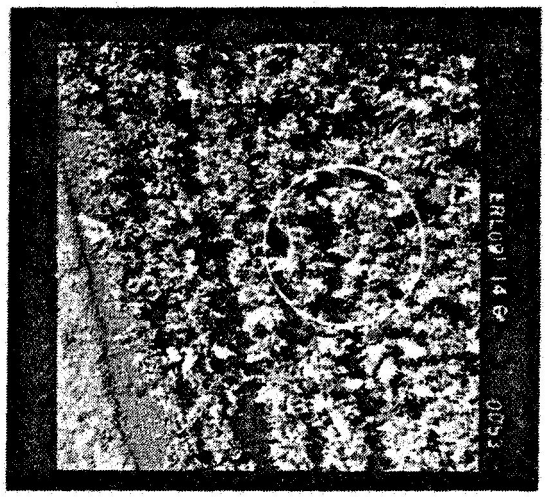
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	.5	1	Moist 1" down	Wilted	Thinned Dec 17
Jan 3, 1974	-	-	Moist 1.5" down	-	-
Jan 10, 1974	2	12	Moist 1.5" down	Normal	-
Jan 14, 1974	3	22	Wet	Normal	-
Jan 25, 1974	4	25	Moist 1" down	Normal	Salt on rows Jan 21, 1974
Jan 30, 1974	5	25	Moist 2" down	Normal	-
Feb 7, 1974	8	30	Wet	Normal	No weeds
Feb 14, 1974	10	35	Moist 1" down	Normal	Beginning to bud
Feb 22, 1974	15	48	-	Normal	-
Feb 28, 1974	17	62	-	Normal	Two blossoms
Mar 8, 1974	23	70	Moist	Normal	Many buds
Mar 13, 1974	34	75	Moist	Normal	Many red blossoms
Mar 20, 1974	38	90	Moist	Normal	Many blossoms - red, pink, white and purple

PLOT NO. 5 POPPY-3

MARCH 20, 1974

GROUND LEVEL



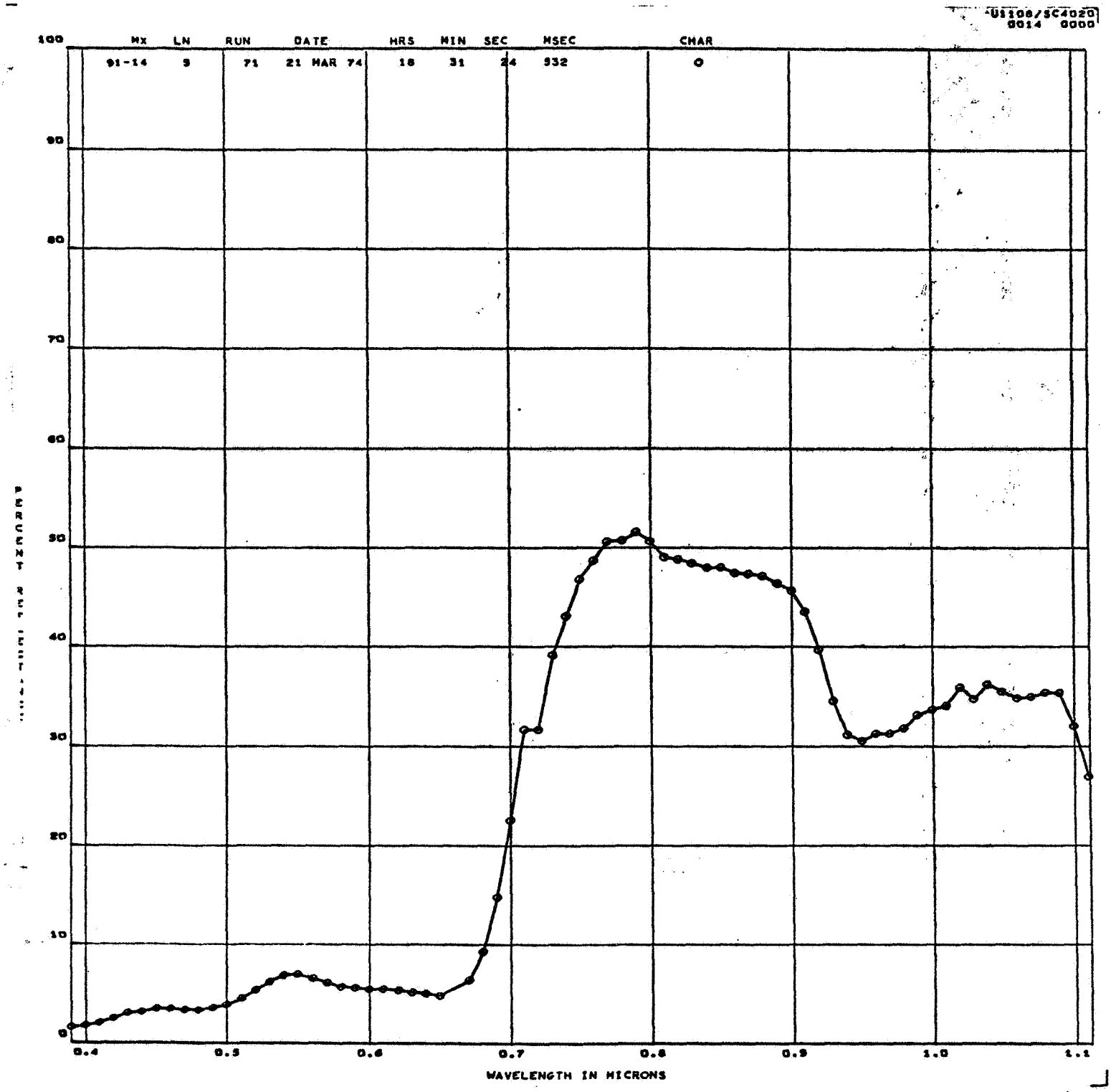
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 5

POPPY-3

SPECTROMETER SIGNATURE



PLOT NO. 6

BARE GROUND
(WET)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 26, 1973	Cultivated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 15, 1974	Irrigated

PLOT NO. 6

BARE GROUND
(WET)

GROUND TRUTH DATA

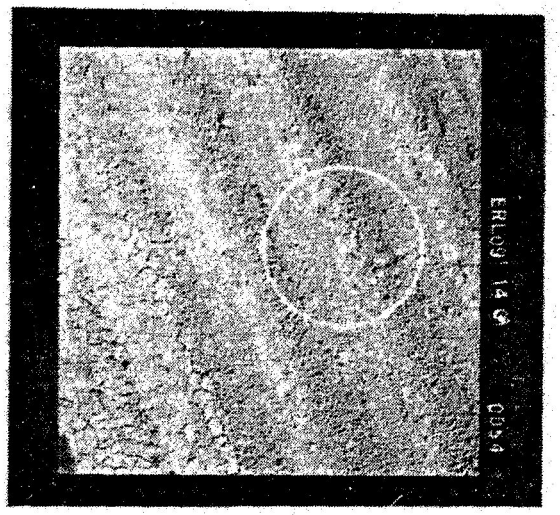
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 12, 1973	-	-	Moist	-	-
Dec 18, 1973	-	-	Moist 1" down	-	-
Jan 3, 1974	-	-	Dry at 6"	-	-
Jan 10, 1974	-	-	Moist .5" down	-	No weeds
Jan 14, 1974	-	-	Dry	-	No weeds
Jan 25, 1974	-	0	Moist 1" down	-	Salt on rows Jan 21, 1974
Jan 30, 1974	-	-	Dry	-	-
Feb 7, 1974	-	-	Dry	-	No weeds
Feb 14, 1974	-	-	-	-	-
Feb 22, 1974	-	0	-	-	-
Feb 28, 1974	-	-	-	-	-
Mar 1, 1974	-	-	-	-	Plot relocated
Mar 13, 1974	-	-	Dry	-	-
Mar 20, 1974	-	-	Dry	-	Some weeds - less than 5% ground cover

PLOT NO. 6

BARE GROUND
(WET)

MARCH 20, 1974

GROUND LEVEL



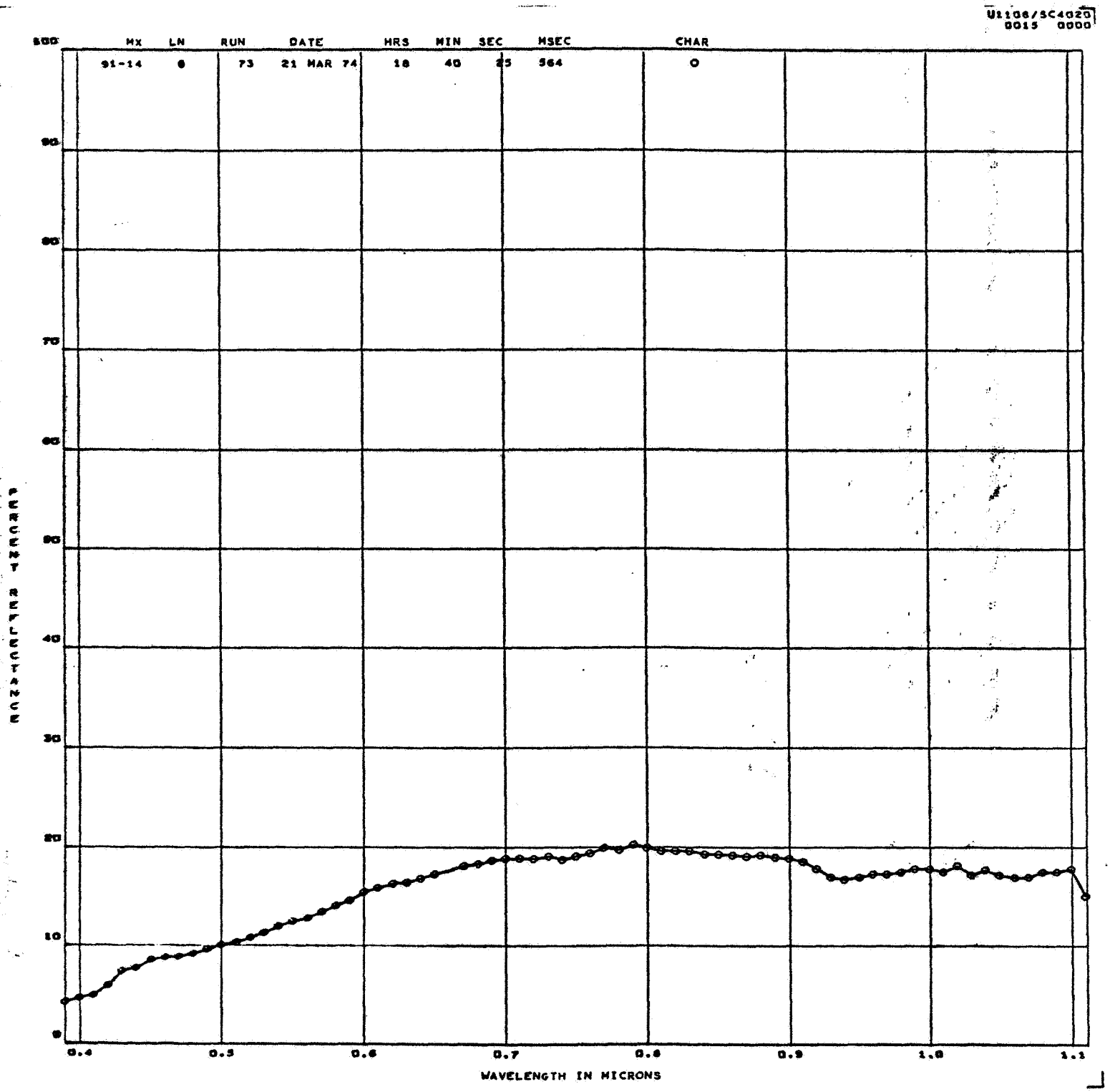
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 6

BARE GROUND
(WET)

SPECTROMETER SIGNATURE



PLOT NO. 12

CAULIFLOWER

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing and 24" spacing in drill
Nov 9, 1973	Irrigated
Nov 13, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 24"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Hoed weeds
Jan 28, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

PLOT NO. 12 CAULIFLOWER

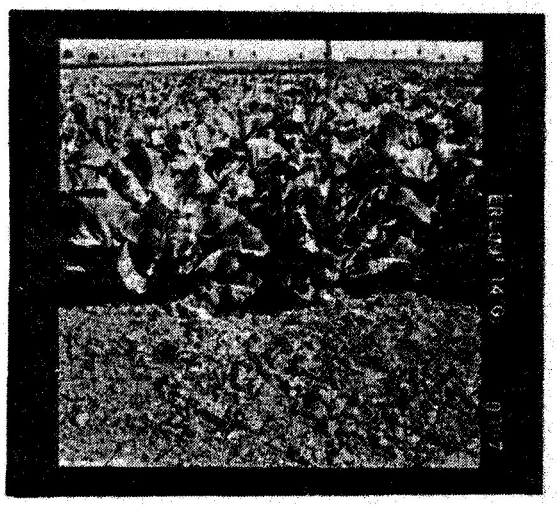
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 12, 1973	1	6	Moist	Normal	-
Dec 18, 1973	2.5	2	Moist 1" down	Wilted	Thinned Dec 17
Jan 3, 1974	4	-	Moist 1.5" down	Cold-wilted	Few weeds
Jan 10, 1974	6	12	Moist .5" down	Normal	-
Jan 14, 1974	6.5	15	Wet	Normal	-
Jan 25, 1974	9	30	Moist 1" down	Normal	5% weeds - salt on row Jan 21, 1974
Jan 30, 1974	9	25	Moist 2" down	Normal	-
Feb 7, 1974	12	25	Wet	Normal	No weeds
Feb 14, 1974	13	27	Moist 1" down	Normal	-
Feb 22, 1974	15	28	-	Normal	-
Feb 28, 1974	19	30	-	Normal	-
Mar 8, 1974	19	33	Moist	Normal	-
Mar 13, 1974	23	45	Moist	Normal	-
Mar 20, 1974	25	50	Moist	Normal	-

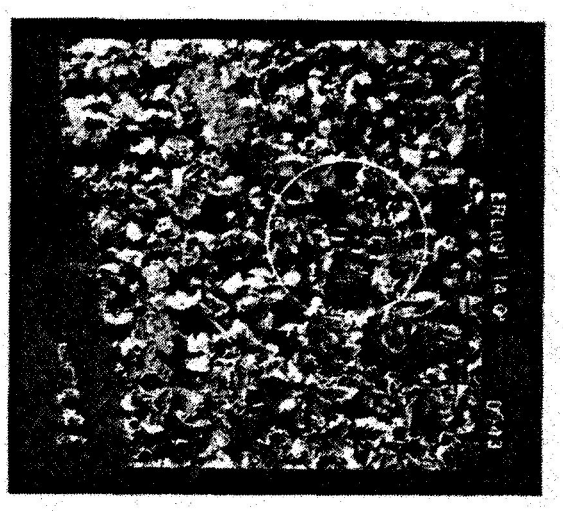
PLOT NO. 12

CAULIFLOWER

MARCH 20, 1974



GROUND LEVEL



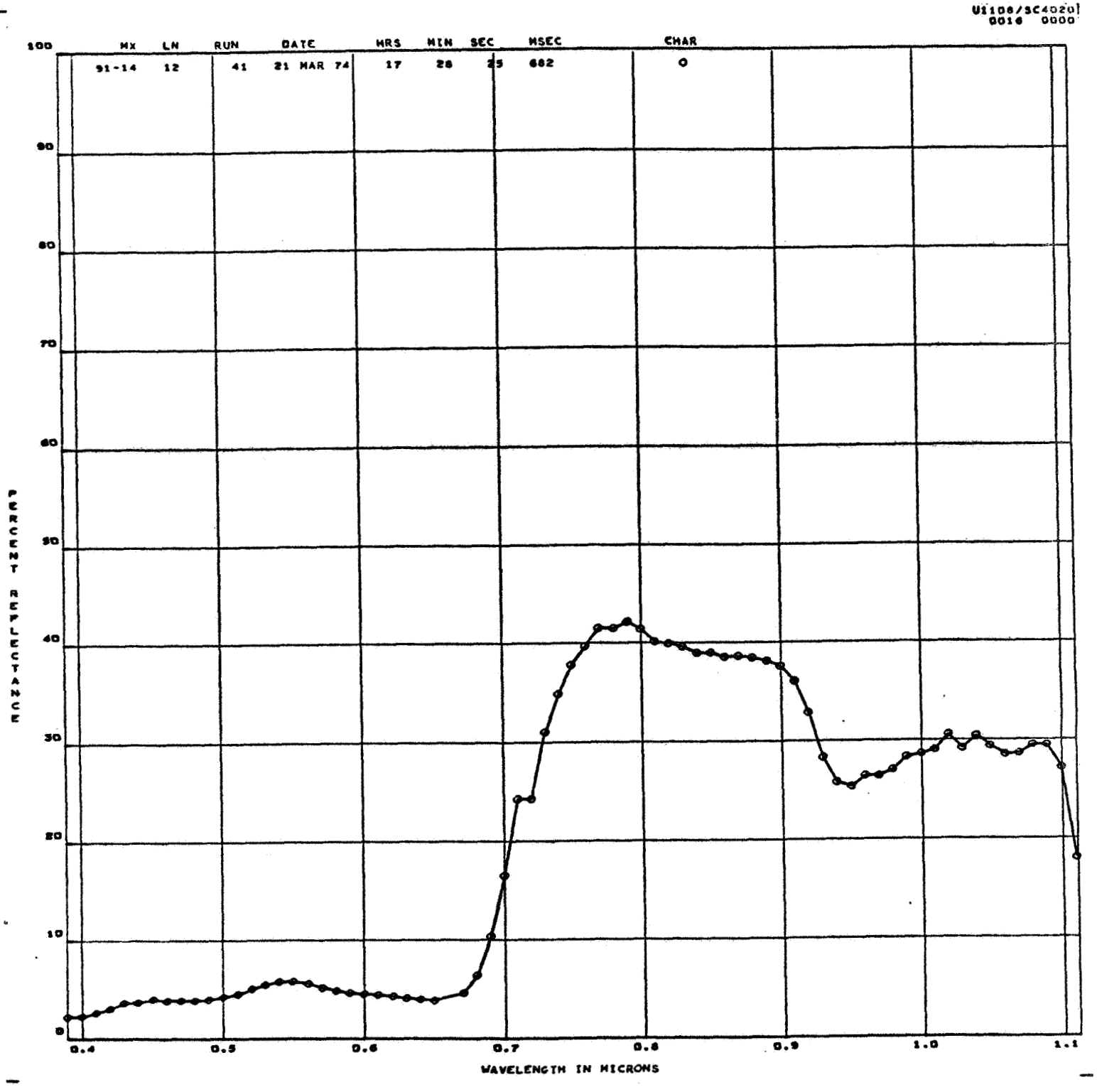
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 12

CAULIFLOWER

SPECTROMETER SIGNATURE



PLOT NO. 13 CARROT

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 4 rows on 40" beds with 4-8-4" spacing
Nov 9, 1973	Irrigated
Nov 21, 1973	Irrigated
Nov 26, 1973	First emergence
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated - Sprayed with Lorax
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

PLOT NO. 13 CARROT

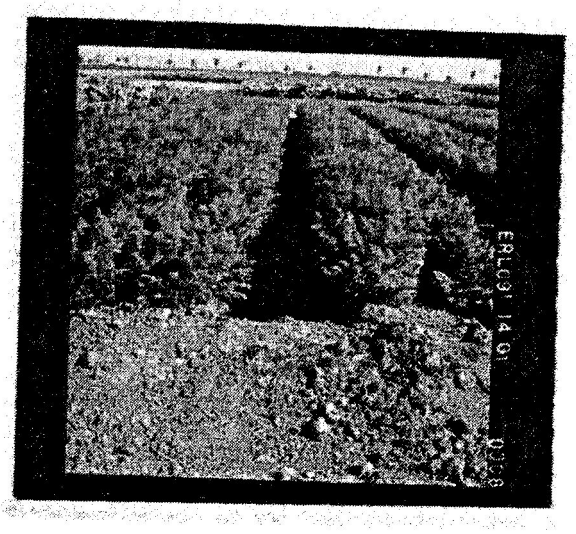
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 12, 1973	.25	-	Moist	Normal	-
Dec 18, 1973	.5	1	Moist 1" down	Normal	-
Jan 3, 1974	1	10	Moist 1.5" down	Normal	1% weeds
Jan 10, 1974	2	30	Moist .5" down	Normal	10% weeds
Jan 14, 1974	2	20	Wet	Normal	7% weeds
Jan 25, 1974	4	31	Moist 1" down	Normal	1% weeds - Tens.= 12 -Salt on rows Jan 21, 1974
Jan 30, 1974	2	31	Moist 2" down	Normal	-
Feb 7, 1974	5	35	Wet	Normal	No weeds -Tens.= 34
Feb 14, 1974	7	40	Moist 1" down	Normal	-
Feb 22, 1974	8	46	-	Normal	Small white - blossoms.Tens.=10 on Feb 11, 15 Feb 13, 14 Feb 15, 28 Feb 19, 37 Feb 20
Feb 28, 1974	9	48	-	Normal	-
Mar 8, 1974	10	51	Moist	Normal	-
Mar 13, 1974	14	55	Moist	Normal	Tens. = 28 on Feb 28, 45 Mar 4, 63 Mar 6, 29 Mar 13, 31 Mar 15
Mar 20, 1974	16	70	Moist	Normal	-

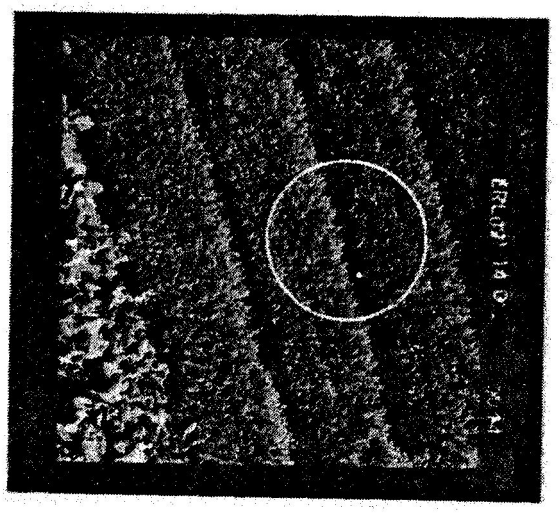
PLOT NO. 13

CARROT

MARCH 20, 1974



GROUND LEVEL



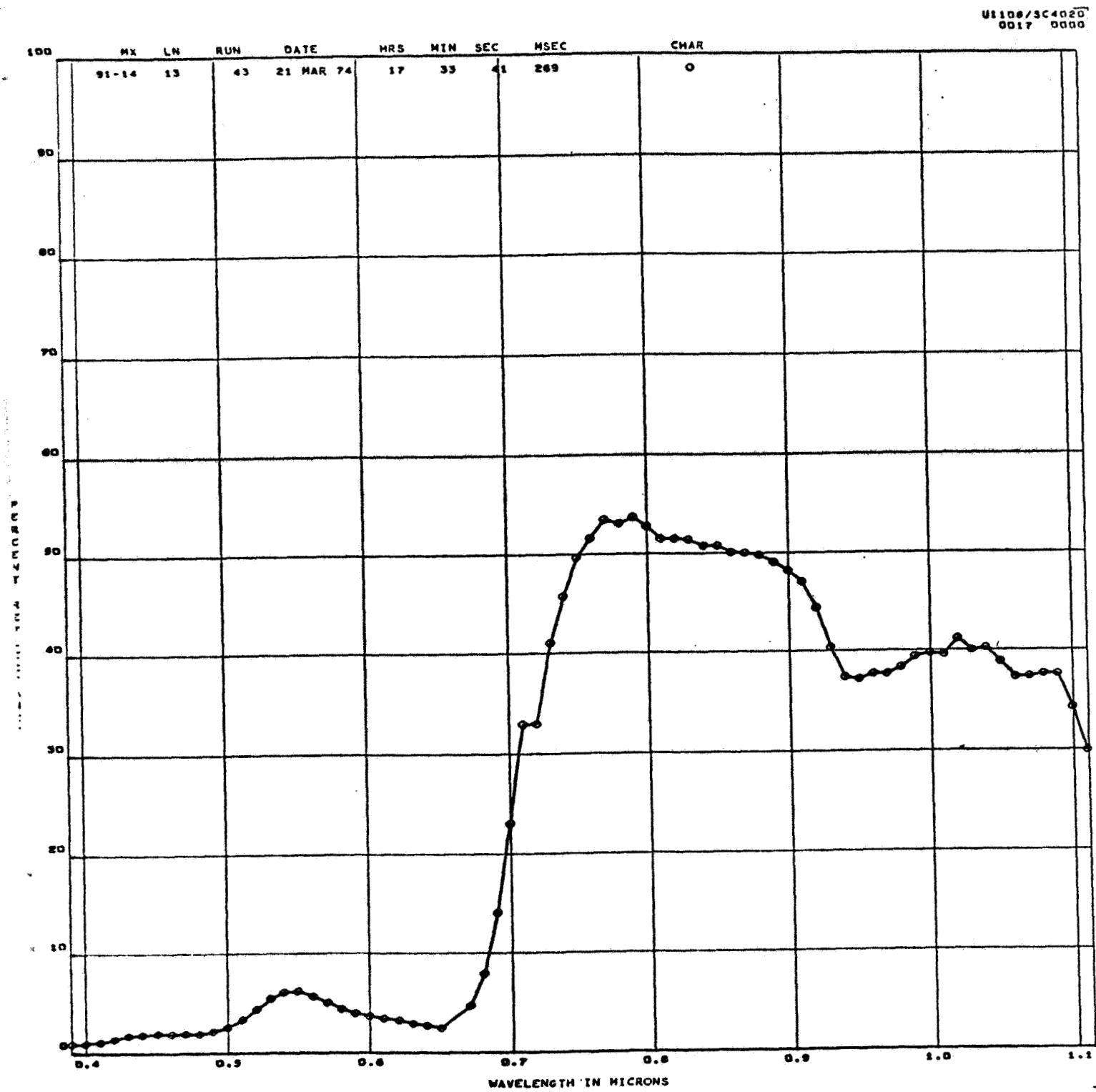
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 13

CARROT

SPECTROMETER SIGNATURE



PLOT NO. 14 CHICK PEAS

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Dec 4, 1973	Planted 2 rows on 40" bed with 12" spacing
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 26, 1973	First emergence - Cultivated
Jan 7, 1974	Poor stand
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Transplanted for proper stand - Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

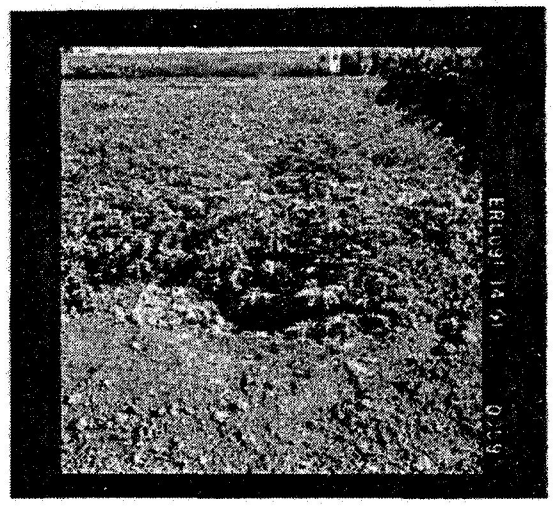
PLOT NO. 14 CHICK PEAS

GROUND TRUTH DATA

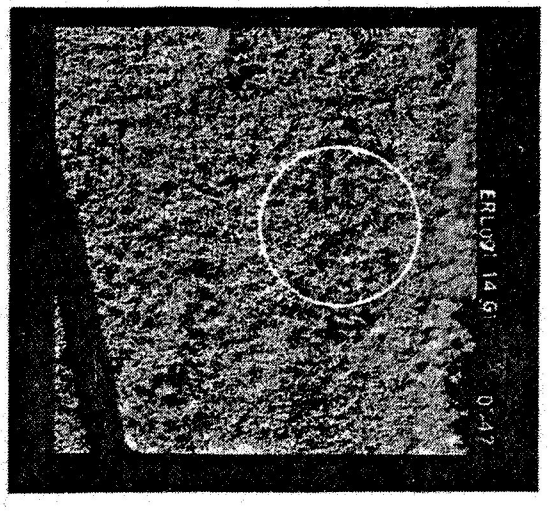
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 12, 1973	-	-	Moist	-	-
Dec 18, 1973	-	0	Moist 1" down	-	-
Jan 3, 1974	1-2	2	Moist 1.5" down	Normal	-
Jan 10, 1974	2.5	3	Moist .5" down	Normal	Poor stand
Jan 14, 1974	4	6	Wet	Normal	Transplanted for good stand
Jan 25, 1974	4	10	Moist 1" down	Normal	Salt on rows Jan 21, 1974
Jan 30, 1974	5	8	Moist 2" down	Normal	-
Feb 7, 1974	7	20	Wet	Normal	No weeds
Feb 14, 1974	8	20	Moist 1" down	Normal	Beginning to bloom, poor - stand
Feb 22, 1974	10	24	-	Normal	-
Feb 28, 1974	12	31	-	Normal	Small white - blossoms
Mar 8, 1974	15	49	Moist	Normal	Small white - blossoms
Mar 13, 1974	16	70	Moist	Normal	Small white - blossoms and pods
Mar 20, 1974	19	90	Moist	Normal	Small white - blossoms and pods

PLOT NO. 14 CHICK PEAS

MARCH 20, 1974



GROUND LEVEL



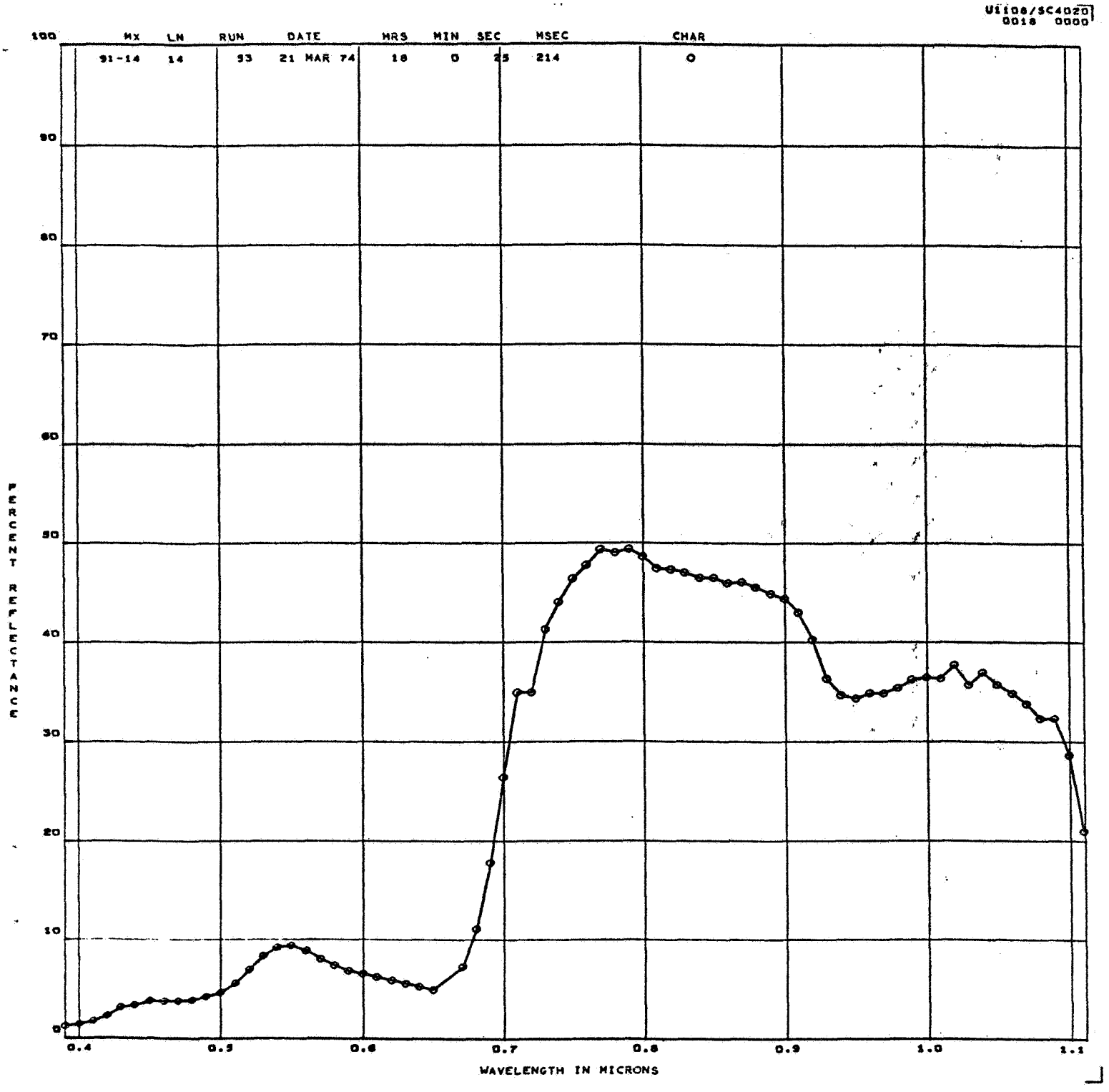
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 14

CHICK PEAS

SPECTROMETER SIGNATURE



PLOT NO. 15

POPPY-2
(Acquisition No. M-89)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1974	Planted 2 rows on 40" beds with 12" spacing and 9" spacing in drill
Nov 9, 1973	Irrigated
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/ Ac - Irrigated
Dec 17, 1973	Thinned to 9"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

PLOT NO. 15

POPPY-2
(Acquisition No. M-89)

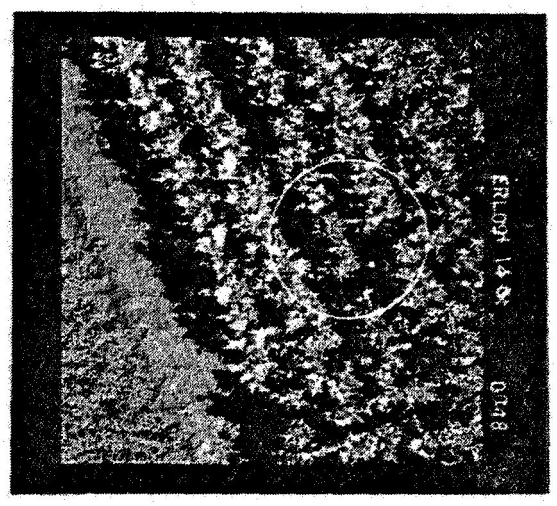
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	1	Moist 1" down	Wilted	Thinned Dec 17
Jan 3, 1974	1.5	5	Moist 1.5" down	Normal	-
Jan 10, 1974	2	10	Moist .5" down	Normal	-
Jan 14, 1974	3	22	Wet	Normal	-
Jan 25, 1974	5	23	Moist 1" down	Normal	Salt on rows Jan 21, 1974
Jan 30, 1974	6	25	Moist 2" down	Normal	-
Feb 7, 1974	8	45	Wet	Normal	No weeds,Tens.= 38
Feb 14, 1974	12	40	Moist 1" down	Normal	
Feb 22, 1974	16	52	-	Normal	Tens. = 13 on Feb 11, 16 Feb 13, 19 Feb 15, 32 Feb 19, 38 Feb 20
Feb 28, 1974	19	71	-	Normal	-
Mar 8, 1974	24	80	Moist	Normal	-
Mar 13, 1974	34	90	Moist	Normal	One white blossom. Tens. = 21 on Feb 28, 48 Mar 4, 64 Mar 6, 24 Mar 13, 31 Mar 15
Mar 20, 1974	45	95	Moist	Normal	Several white - blossoms

PLOT NO. 15 POPPY-2

MARCH 20, 1974

GROUND LEVEL



BORESIGHT

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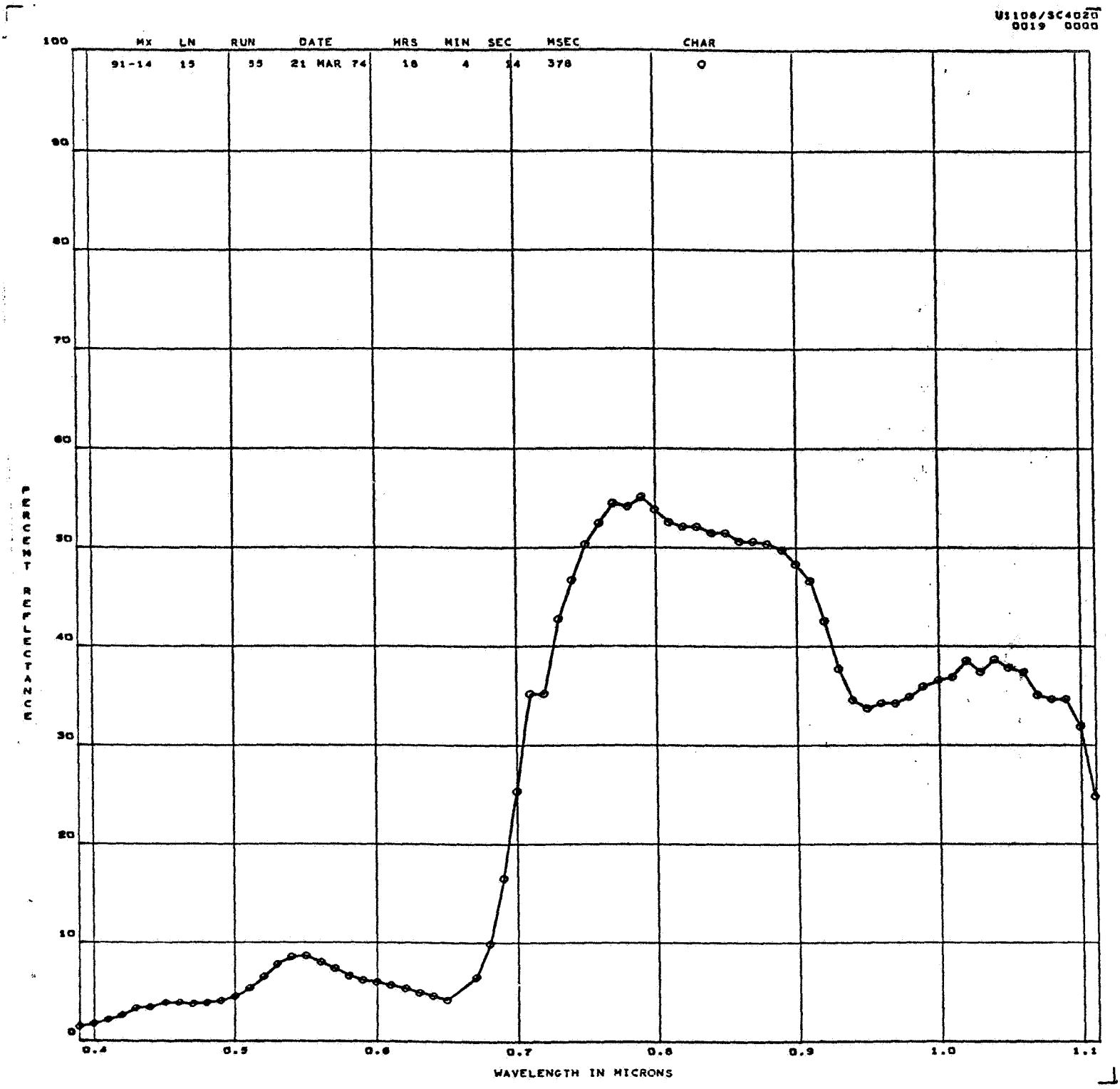
PLOT NO. 15

POPPY -2

SPECTROMETER SIGNATURE



PLOT NO. 16

POPPY-4
(Mixture of Poppy 1, 2, 3,)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing and 9" spacing in drill
Nov 9, 1973	Irrigated
Nov 13, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 9"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

PLOT NO. 16

POPPY-4
(Mixture of 1, 2, 3,)

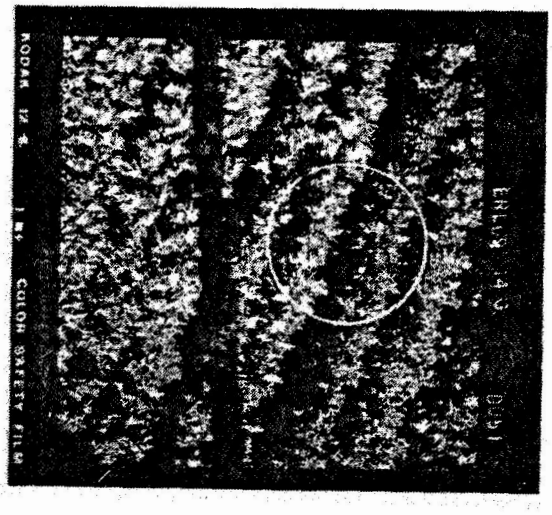
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 12, 1973	.5	-	Moist	Normal	-
Dec 18, 1973	1	1	Moist 1" down	Normal	Thinned Dec 12
Jan 3, 1974	1	3	Moist 1.5" down	Normal	-
Jan 10, 1974	2	10	Moist .5" down	Normal	-
Jan 14, 1974	2.5	20	Wet	Normal	-
Jan 25, 1974	4	20	Moist 1" down	Normal	Salt on rows - Jan 21, 1974
Jan 30, 1974	6	23	Moist 2" down	Normal	-
Feb 7, 1974	7	35	Wet	Normal	No weeds
Feb 14, 1974	10	35	Moist 1" down	Normal	-
Feb 22, 1974	15	49	-	Normal	-
Feb 28, 1974	18	59	-	Normal	-
Mar 8, 1974	20	65	Moist	Normal	-
Mar 13, 1974	32	75	Moist	Normal	-
Mar 20, 1974	44	85	Moist	Normal	Several blossoms red - purple

PLOT NO. 16 POPPY-4

MARCH 20, 1974

GROUND LEVEL



BORESIGHT

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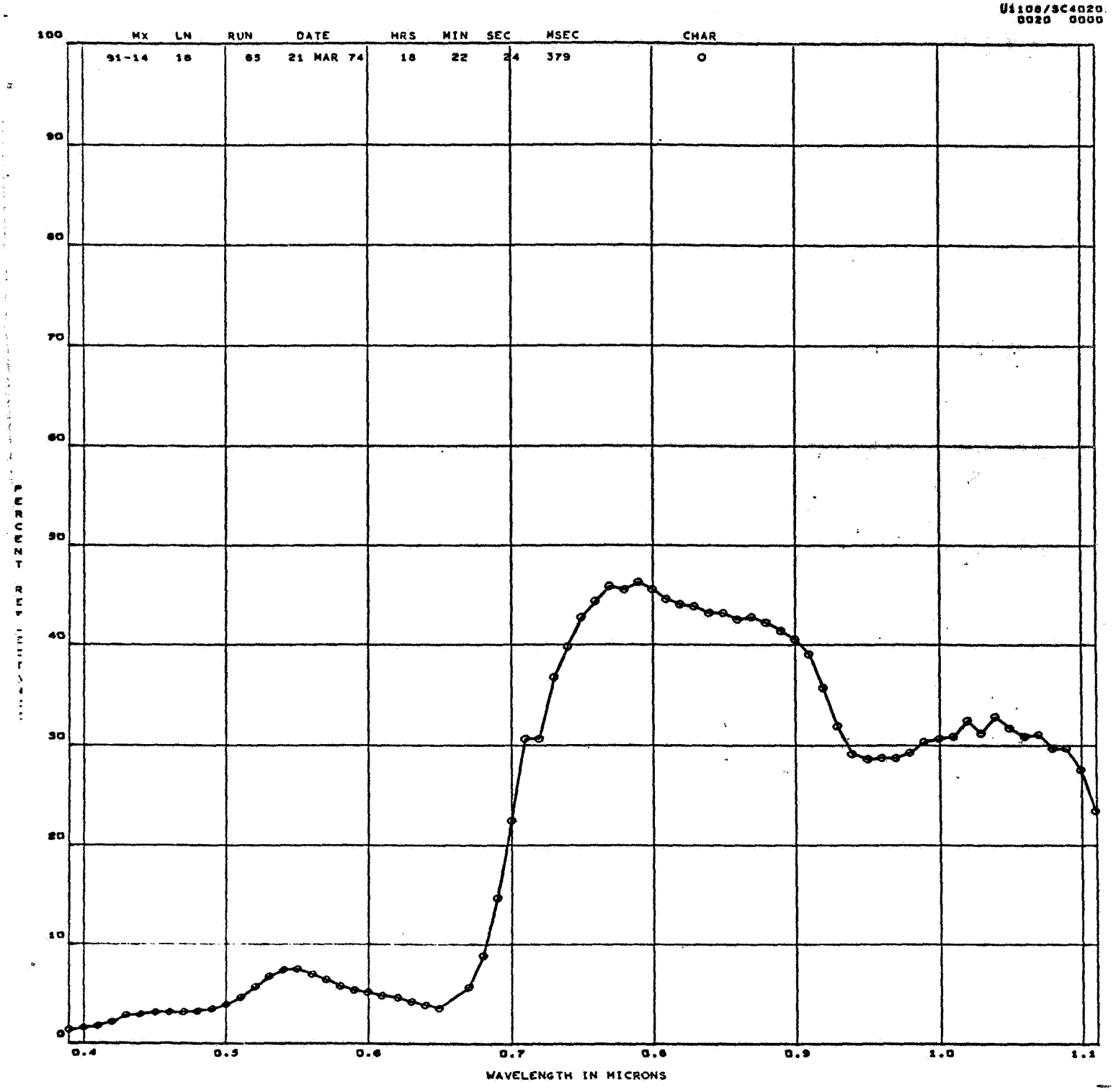
PLOT NO. 16

POPPY-4

SPECTROMETER SIGNATURE



PLOT NO. 17

POPPY - 6

(Acquisition No. B-40-6-3)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing and 9" spacing in drill
Nov 9, 1973	Irrigated
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 9"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 4, 1974	Irrigated
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Feb 20, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin
Mar 15, 1974	Irrigated

PLOT NO. 17

POPPY-6
(Acquisition No. B-40-6-3)

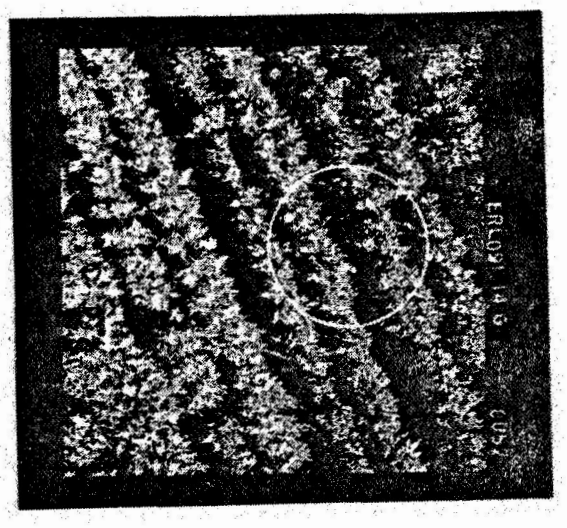
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	1	Moist 1" down	Wilted	Thinned Dec 12
Jan 3, 1974	1-2	4	Moist 1.5" down	Normal	-
Jan 10, 1974	2	10	Moist .5" down	Normal	-
Jan 14, 1974	2.5	20	Wet	Normal	-
Jan 25, 1974	5	22	Moist 1" down	Normal	Salt on rows Jan 21, 1974
Jan 30, 1974	6	35	Moist 2" down	Normal	-
Feb 7, 1974	7	30	Wet	Normal	No weeds
Feb 14, 1974	11	38	Moist 1" down	Normal	-
Feb 22, 1974	14.5	48	-	Normal	-
Feb 28, 1974	16	52	-	Normal	-
Mar 8, 1974	16	59	Moist	Normal	-
Mar 13, 1974	33	75	Moist	Normal	-
Mar 20, 1974	44	80	Moist	Normal	Two purple blossoms -

PLOT NO. 17 POPPY-6

MARCH 20, 1974

GROUND LEVEL



BORESIGHT

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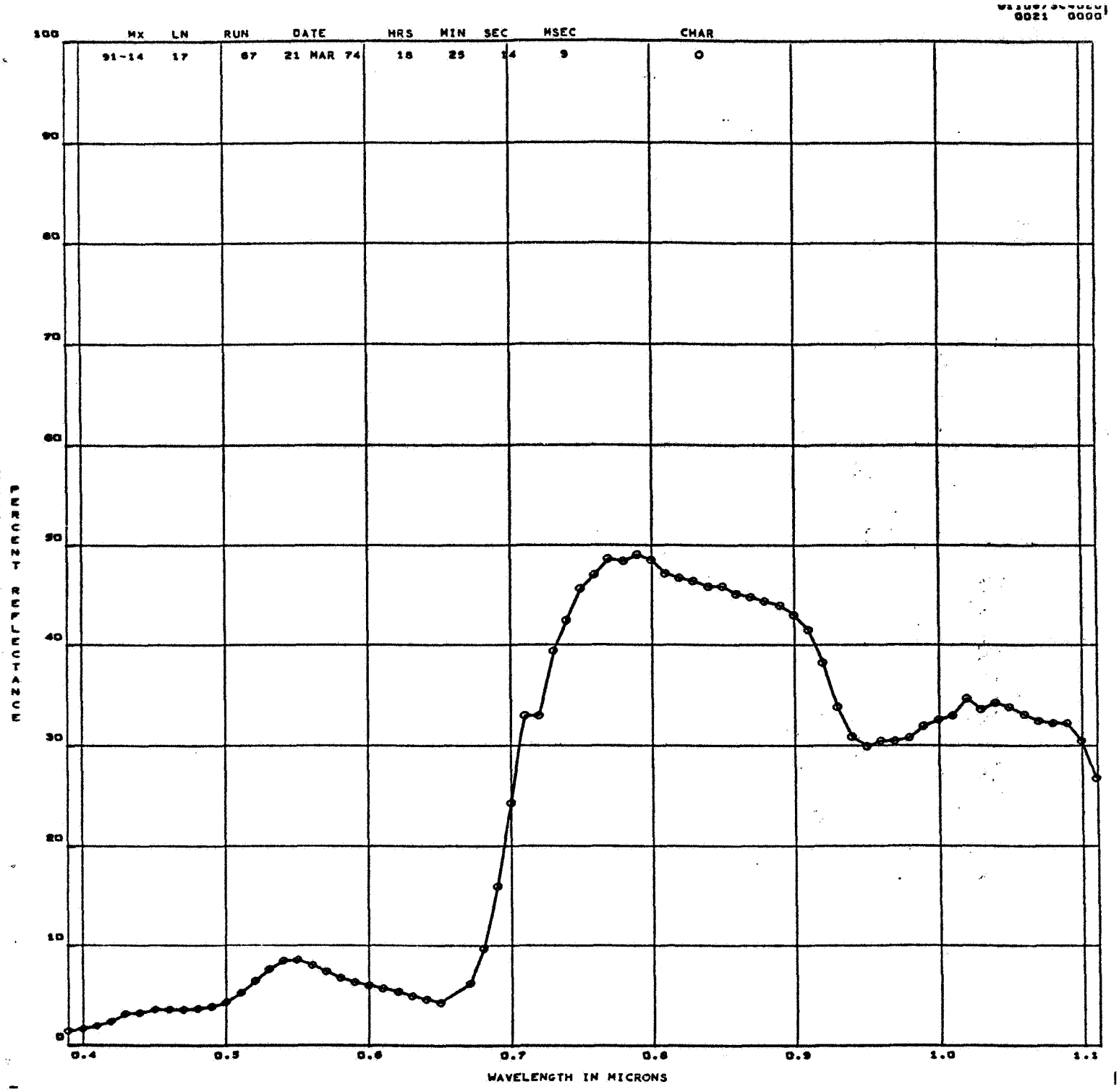
PLOT NO. 17 POPPY-6

SPECTROMETER SIGNATURE



PLOT NO. 23 CABBAGE

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing
Nov 9, 1973	Irrigated
Nov 12, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 12"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 23 CABBAGE

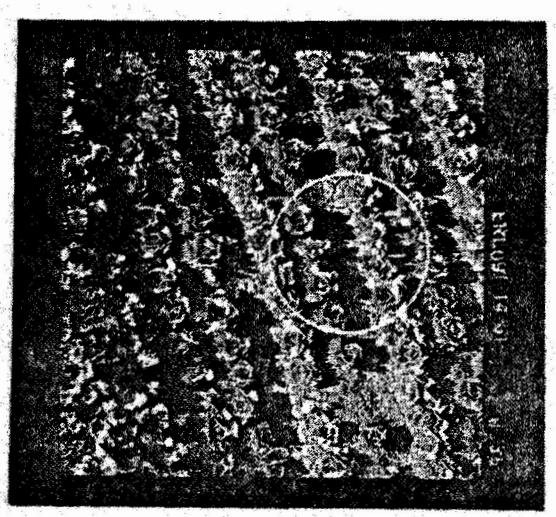
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	1	Moist 1" down	Wilted	Thinned Dec 17 1973
Jan 3, 1974	3-4	2	Moist 1.5" down	Normal	-
Jan 10, 1974	5	17	Moist .5" down	Normal	-
Jan 14, 1974	5	20	Wet	Normal	-
Jan 25, 1974	5	17	Moist 3" down	Normal	Salt on rows - Jan 21, 1974
Jan 30, 1974	5	15	Moist 2" down	Normal	-
Feb 7, 1974	6	20	Dry	Normal	No weeds
Feb 14, 1974	7	20	Dry	Normal	-
Feb 22, 1974	7	22	-	Normal	-
Feb 28, 1974	7.25	23	-	Normal	-
Mar 8, 1974	8	25	Moist	Normal	-
Mar 13, 1974	9	27	Moist	Normal	-
Mar 20, 1974	9.5	28	Dry	Normal	-

PLOT NO. 23 CABBAGE

MARCH 20, 1974

GROUND LEVEL



BORESIGHT

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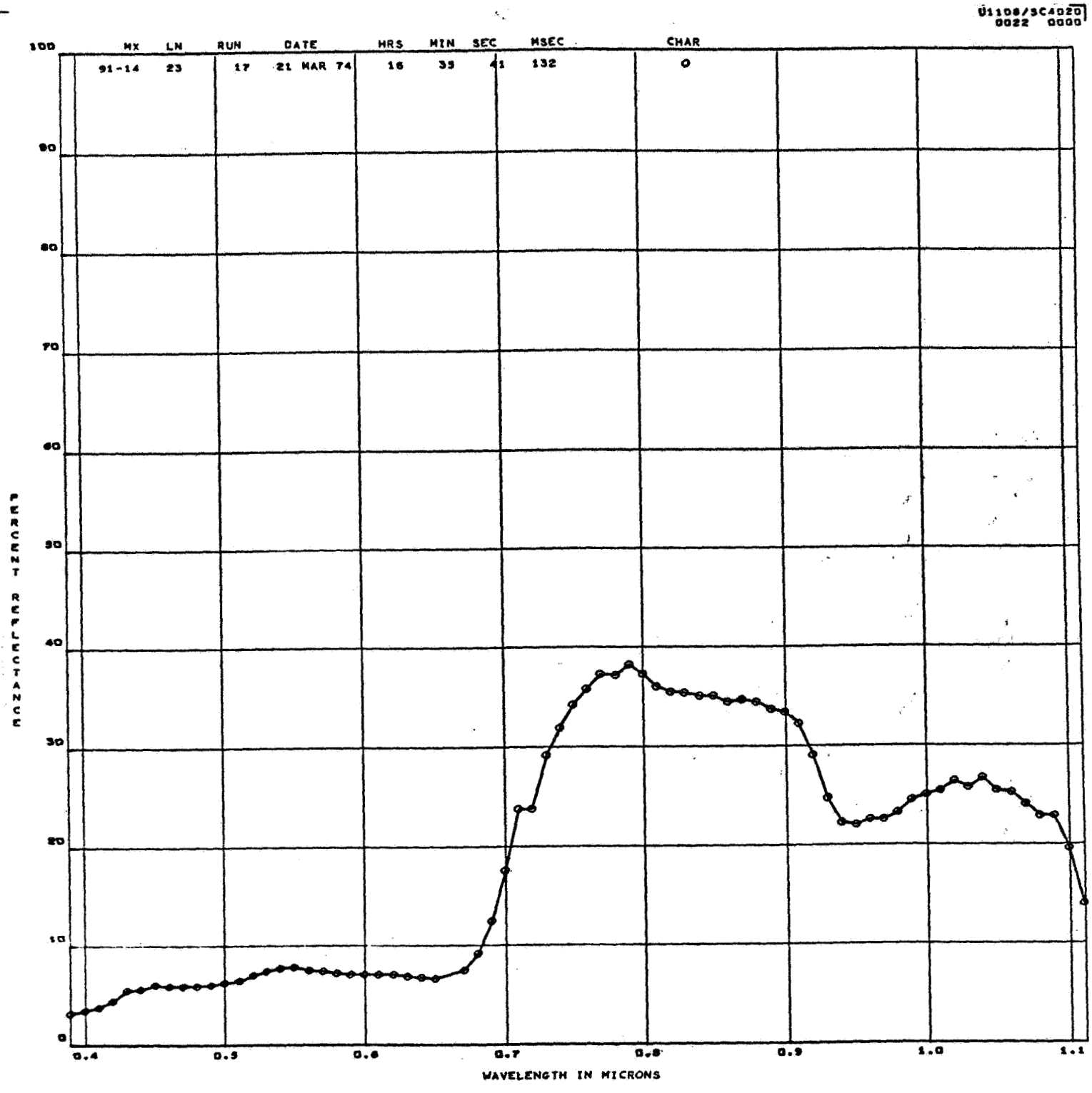
PLOT NO. 23

CABBAGE

SPECTROMETER SIGNATURE



PLOT NO. 24 BROCCOLI

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing
Nov 9, 1973	Irrigated
Nov 12, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 14"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 24 BROCCOLI

GROUND TRUTH DATA

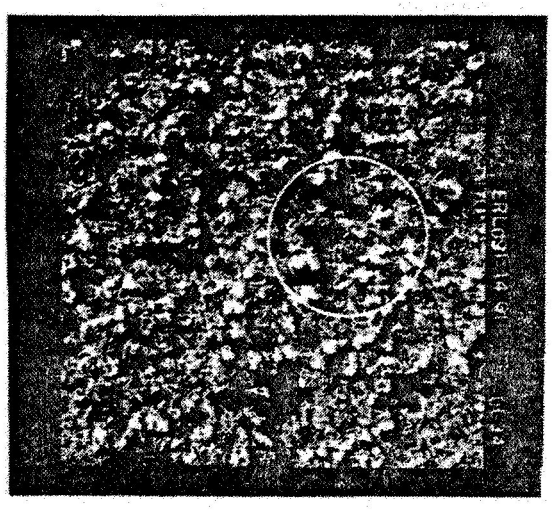
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	1	Moist 1" down	Wilted	Thinned Dec 17
Jan 3, 1974	3	1	Moist 1.5" down	Normal	-
Jan 10, 1974	5	15	Moist 1.5" down	Normal	-
Jan 14, 1974	6	18	Wet	Normal	-
Jan 25, 1974	5	17	Moist 3" down	Normal	Tens.= 3 5% weeds - salt on rows Jan 21, 1974
Jan 30, 1974	7	17	Moist 2" down	Normal	-
Feb 7, 1974	8	20	Dry	Normal	No weeds, Tens. = 30
Feb 14, 1974	9	25	Dry	Normal	-
Feb 22, 1974	10	27	-	Normal	Tens. = 61 on Feb 11, 66 Feb 13, 67 Feb 15, 12 Feb 20
Feb 28, 1974	12	36	-	Normal	-
Mar 8, 1974	12	40	Moist	Normal	-
Mar 13, 1974	21	55	Moist	Normal	Tens. = 38 on Feb 28, 61 Mar 4, 67 Mar 6, 27 Mar 13, 39 Mar 15
Mar 20, 1974	21	60	Dry	Normal	Beginning to head

PLOT NO. 24

BROCCOLI

MARCH 20, 1974

GROUND LEVEL



BORESIGHT

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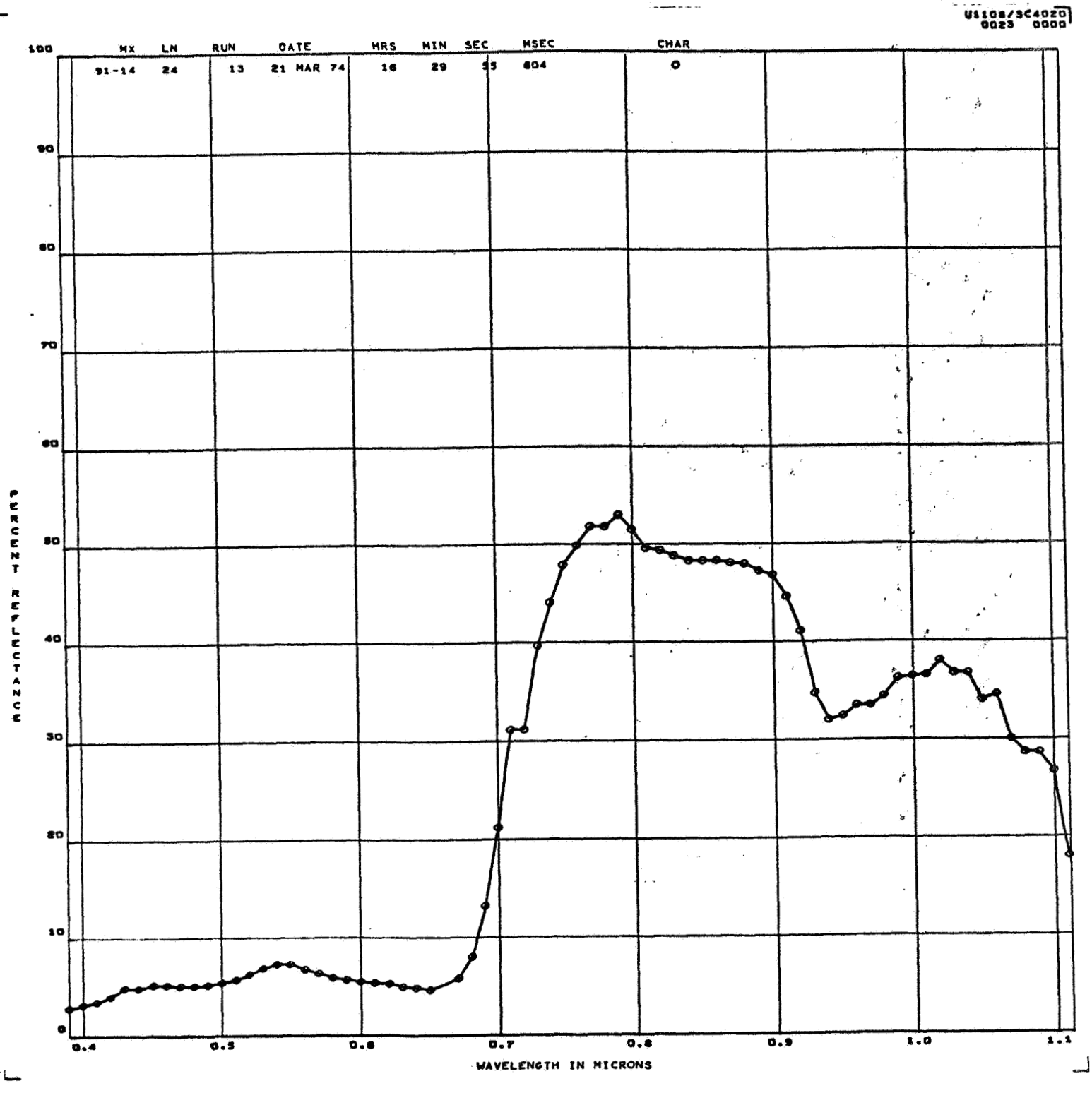
PLOT NO. 24

BROCCOLI

SPECTROMETER SIGNATURE



PLOT NO. 25 ONIONS

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 4 rows on 40" beds with 4-8-4" spacing
Nov 9, 1973	Irrigated
Nov 21, 1973	Irrigated
Nov 26, 1973	First emergence
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Hand weeded - Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 25 ONIONS

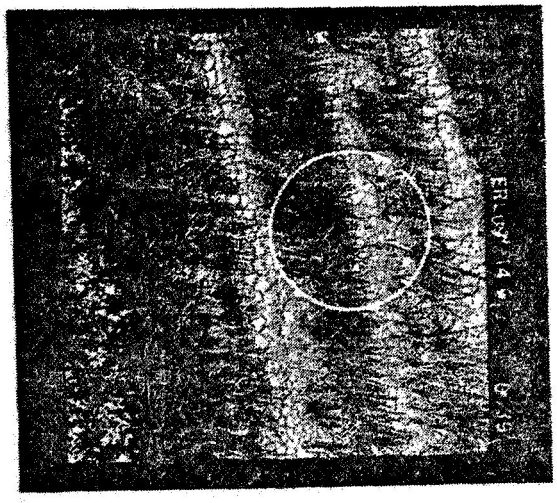
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	3	Moist 1" down	Sprouts emerging	-
Jan 3, 1974	2-3	4	Moist 1.5" down	Normal	-
Jan 10, 1974	3	15	Moist .5" down	Normal	5% weeds
Jan 14, 1974	4	8	Wet	Normal	Thinned and weeded - Jan 14, 1974
Jan 25, 1974	6	8	Moist 3" down	Normal	Salt on rows - Jan 21, 1974
Jan 30, 1974	7	10	Moist 2" down	Normal	-
Feb 7, 1974	7	10	Dry	Normal	No weeds
Feb 14, 1974	9	12	Dry	Normal	-
Feb 22, 1974	9.5	14	-	Normal	-
Feb 28, 1974	9.5	20	-	Normal	-
Mar 8, 1974	11	20	Moist	Normal	-
Mar 13, 1974	14	23	Moist	Normal	-
Mar 20, 1974	16	25	Dry	Normal	-

PLOT NO. 25 ONIONS

MARCH 20, 1974

GROUND LEVEL



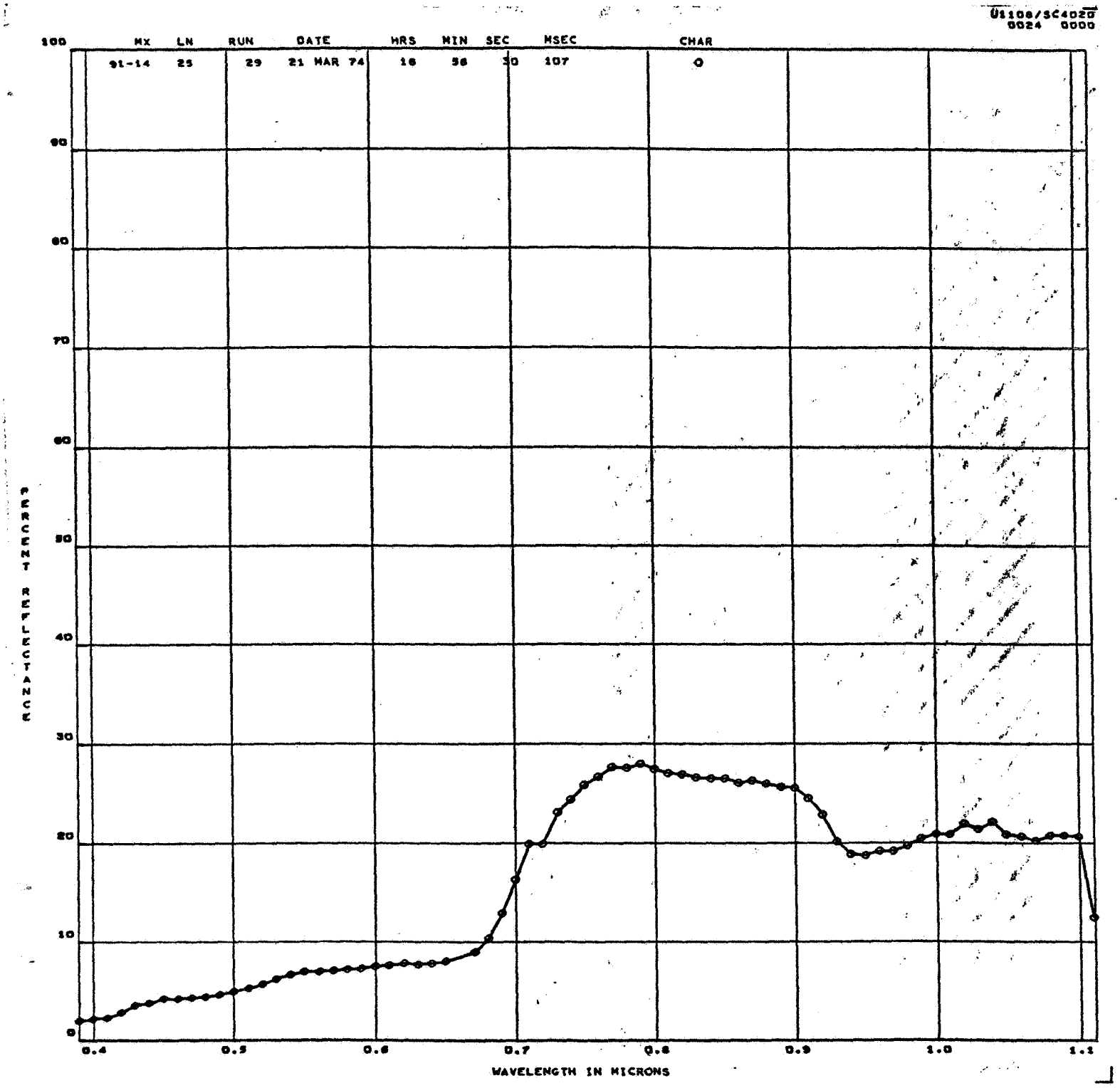
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 25

ONIONS

SPECTROMETER SIGNATURE



PLOT NO. 26

POPPY-1
(Acquisition No. B-40-6-3)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing and 9" Spacing in drill
Nov 9, 1973	Irrigated
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 9"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 26

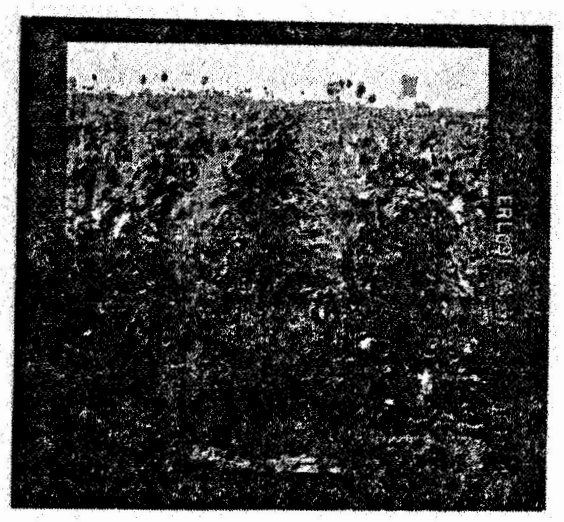
POPPY-1
(Acquisition No. 8-40-6-3)

GROUND TRUTH DATA

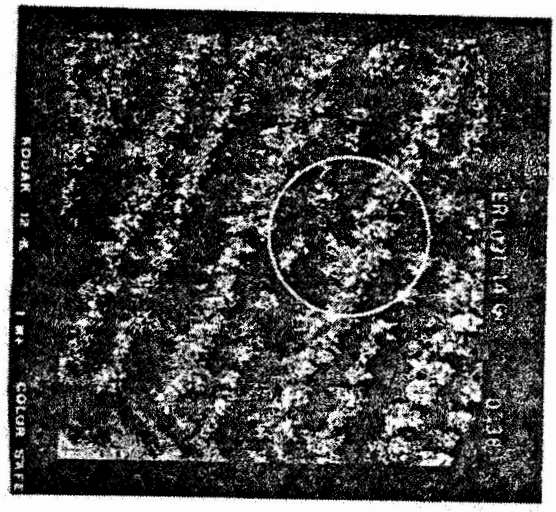
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	1	Moist 1" down	Wilted	Thinned Dec 17
Jan 3, 1974	1-1.5	4	Moist 1.5" down	Normal	-
Jan 10, 1974	2	12	Moist .5" down	Normal	-
Jan 14, 1974	3	22	Wet	Normal	-
Jan 25, 1974	4	15	Moist 3" down	Normal	Tens. = 11 Salt on rows - Jan 21, 1974
Jan 30, 1974	6	18	Moist 2" down	Normal	-
Feb 7, 1974	8	30	Dry	Normal	No weeds Tens. = 50
Feb 14, 1974	11	35	Dry	Normal	-
Feb 22, 1974	13.5	40	-	Normal	Tens. = 80 on Feb 11, 84 Feb 13, 79 Feb 15, 10 Feb 20
Feb 28, 1974	16	59	-	Normal	-
Mar 8, 1974	23	65	Moist	Normal	-
Mar 13, 1974	34	75	Moist	Normal	Tens. = 37 on Feb 28, 59 Mar 4, 69 Mar 6, 20 Mar 13, 31 Mar 15
Mar 20, 1974	40	85	Dry	Normal	-

PLOT NO. 26 POPPY-1

MARCH 20, 1974



GROUND LEVEL



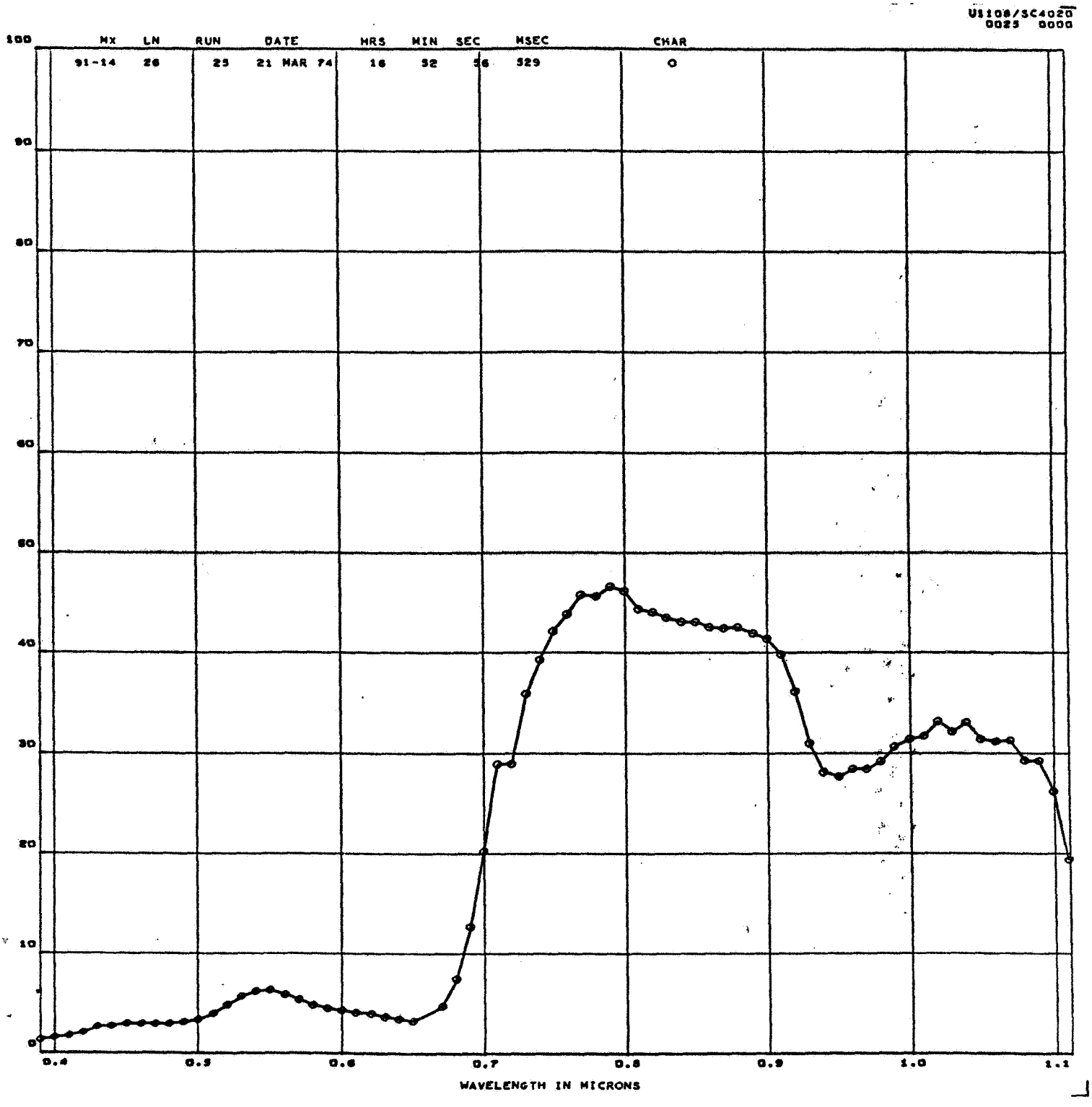
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 26

POPPY-1

SPECTROMETER SIGNATURE



PLOT NO. 27

POPPY-3
(Acquisition No. 371923)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing and 9" spacing in drill
Nov 9, 1973	Irrigated
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 9"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 27

POPPY-3
(Acquisition No. 371923)

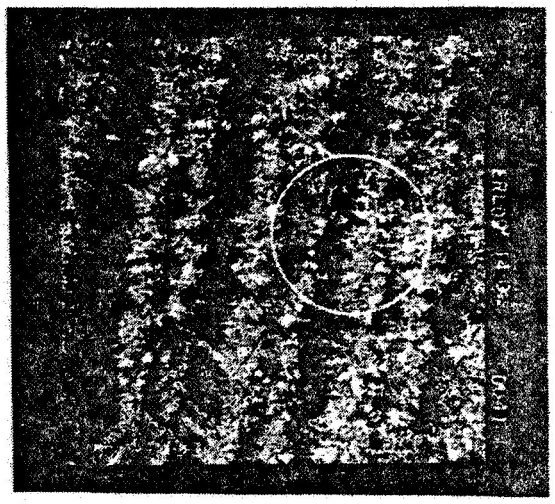
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	1	Moist 1" down	Wilted	Thinned Dec 17
Jan 3, 1974	1	2	-	Normal	-
Jan 10, 1974	2	12	Moist .5" down	Normal	Few weeds
Jan 14, 1974	3	22	Wet	Normal	-
Jan 25, 1974	4	20	Moist 3" down	Normal	1% weeds Salt on rows Jan 21, 1974
Jan 30, 1974	4	15	Moist 2" down	Normal	-
Feb 7, 1974	5	25	Dry	Normal	No weeds
Feb 14, 1974	6	25	Dry	Normal	-
Feb 22, 1974	8.5	35	-	Normal	-
Feb 28, 1974	12	59	-	Normal	Two blossoms
Mar 8, 1974	19	65	Moist	Normal	Several blossoms and buds
Mar 13, 1974	29	70	Moist	Normal	Many red - blossoms
Mar 20, 1974	34	80	Dry	Normal	-

PLOT NO. 27 POPPY-3

MARCH 20, 1974

GROUND LEVEL



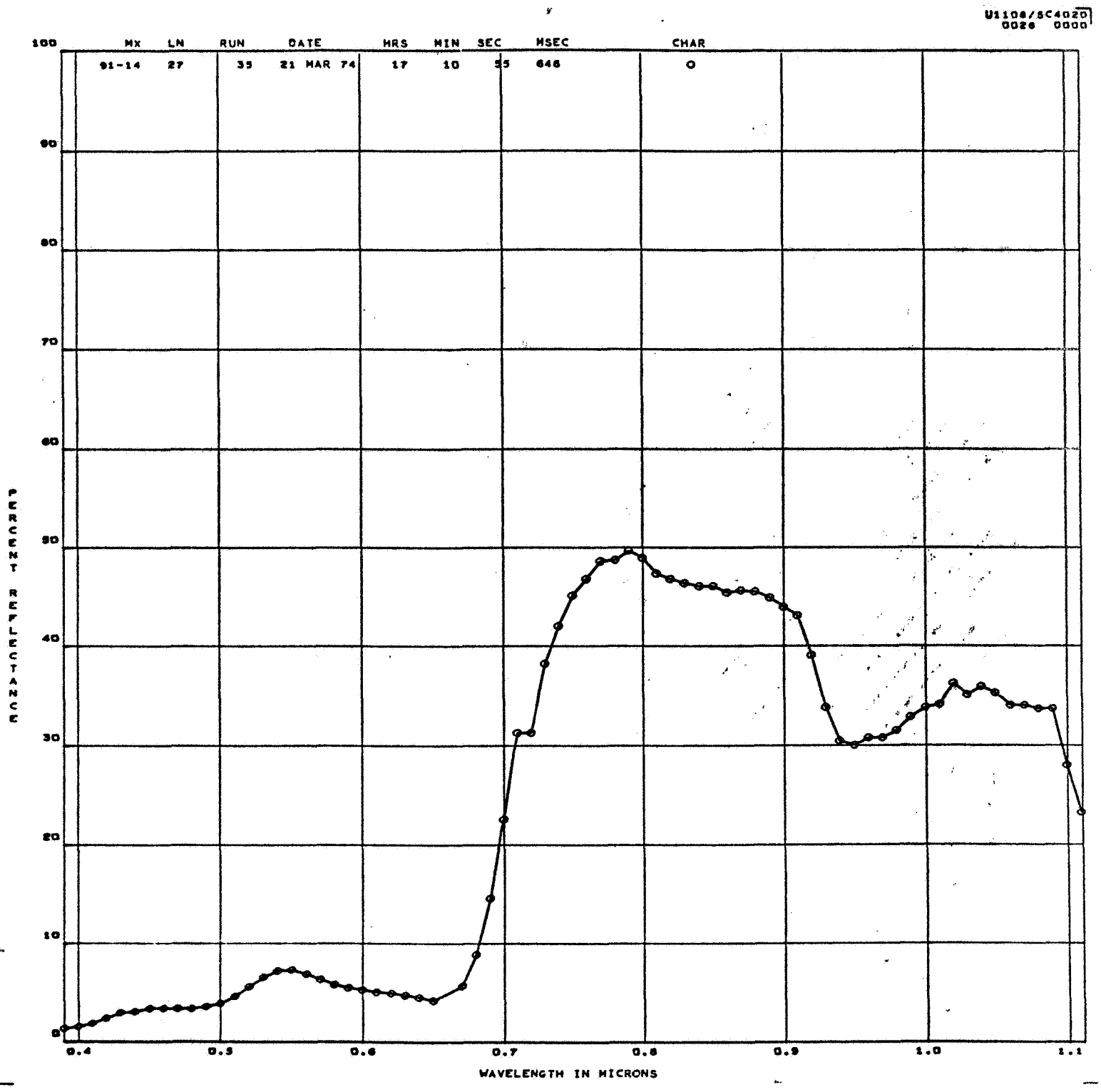
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 27

POPPY-3

SPECTROMETER SIGNATURE



PLOT NO. 34 CAULIFLOWER

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing and 24" spacing in drill
Nov 9, 1973	Irrigated
Nov 13, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 24"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 34 CAULIFLOWER

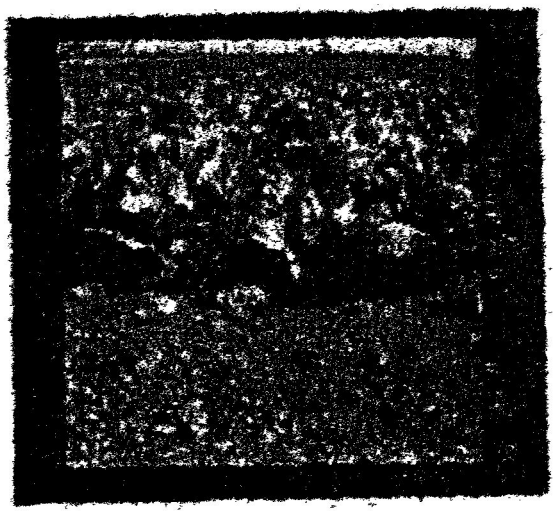
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	1	Moist 1" down	Wilted	Thinned Dec 17
Jan 3, 1974	2	2	Moist 1.5" down	Normal	-
Jan 10, 1974	6	12	Moist .5" down	Normal	-
Jan 14, 1974	6.5	15	Wet	Normal	-
Jan 25, 1974	8	20	Moist 3" down	Normal	2% weeds - salt on rows, Jan 21, 1974
Jan 30, 1974	9	20	Moist 2" down	Normal	-
Feb 7, 1974	12	30	Dry	Normal	No weeds
Feb 14, 1974	14	31	Dry	Normal	-
Feb 22, 1974	14	31	-	Normal	-
Feb 28, 1974	17	34	-	Normal	-
Mar 8, 1974	19	38	Moist	Normal	-
Mar 13, 1974	20	43	Moist	Normal	-
Mar 20, 1974	23	50	Dry	Normal	-

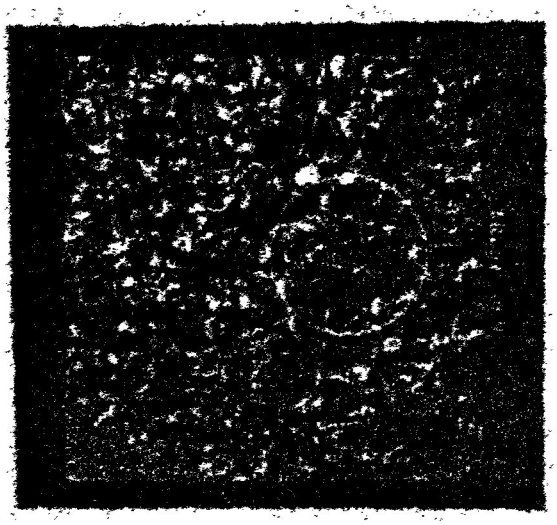
PLOT NO. 34

CAULIFLOWER

MARCH 20, 1974



GROUND LEVEL



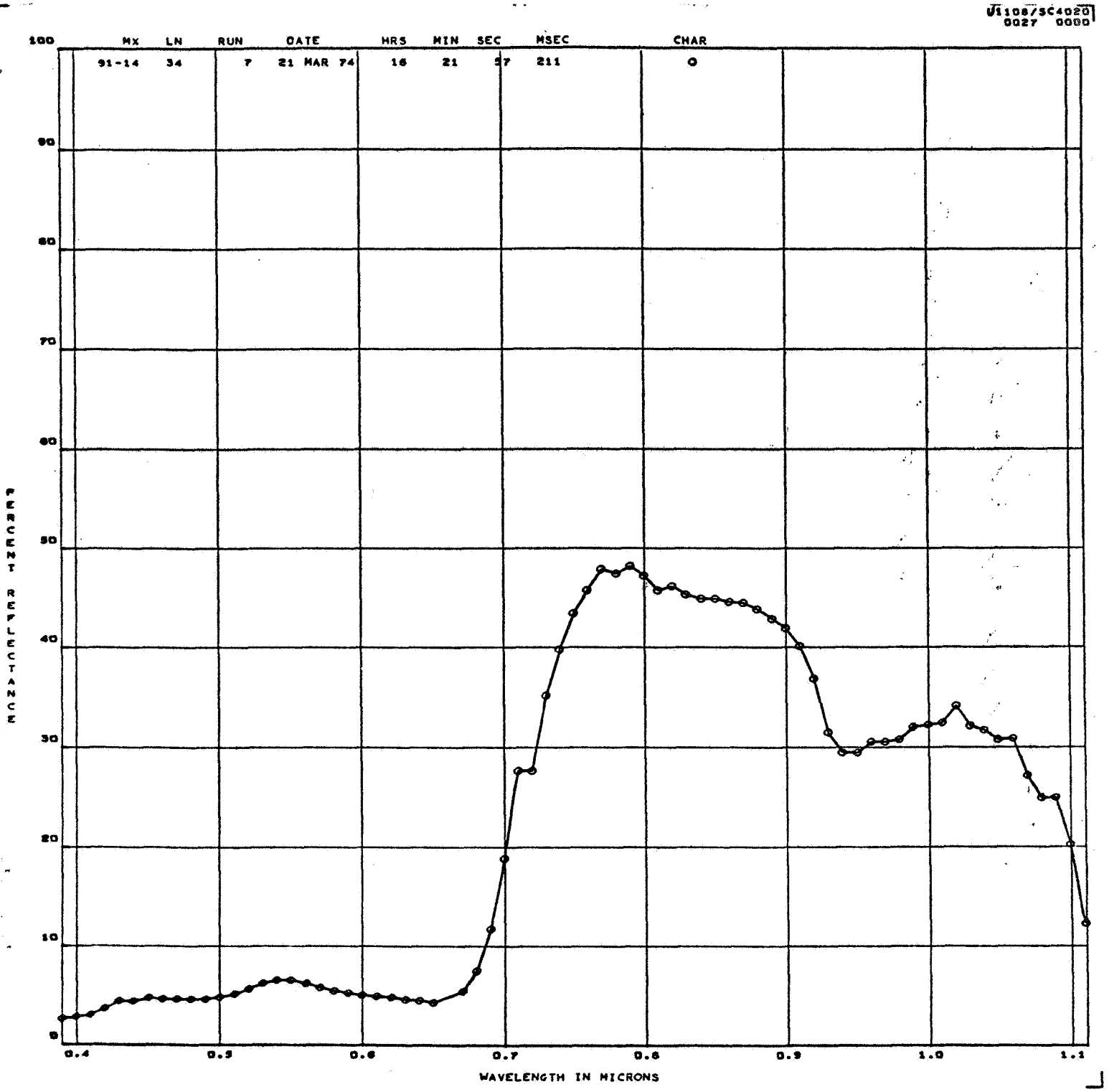
HORESIGHT

Circle represents spectrometer signature

PLOT NO. 34

CAULIFLOWER

SPECTROMETER SIGNATURE



PLOT NO. 35 CARROT

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 4 rows on 40" beds with 4-8-4" spacing
Nov 9, 1973	Irrigated
Nov 21, 1973	Irrigated
Nov 26, 1973	First emergence
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated - Sprayed with Lorax
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 35

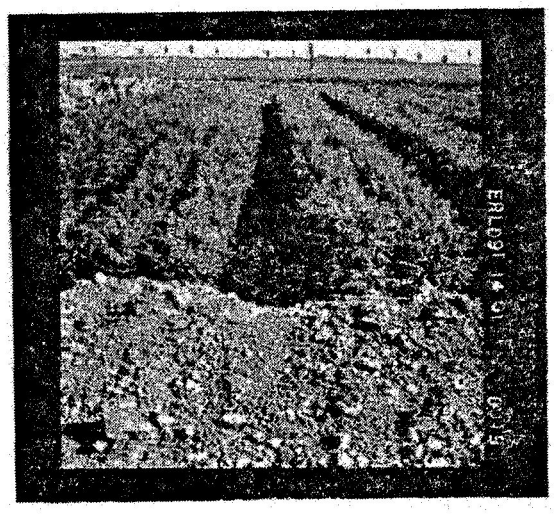
CARROT

GROUND TRUTH DATA

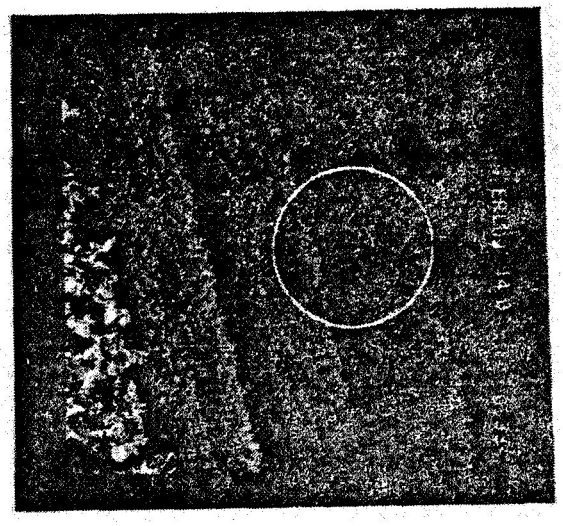
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	1	Moist 1" down	Sprouts emerged	-
Jan 3, 1974	-	-	Moist 1" down	-	-
Jan 10, 1974	2	30	Moist .5" down	Normal	10% weeds
Jan 14, 1974	2	20	Wet	Normal	7% weeds
Jan 25, 1974	4	33	Moist 3" down	Normal	3% weeds Tens. = 8 Salt on rows Jan 21, 1974
Jan 30, 1974	4	30	Moist 2" down	Normal	-
Feb 7, 1974	4	33	Dry	Normal	No weeds Tens. = 50
Feb 14, 1974	5	33	Dry	Normal	-
Feb 22, 1974	5	33	-	Normal	Tens. = 59 on Feb 11, 62 Feb 13, 79 Feb 15, 10 Feb 20
Feb 28, 1974	6.5	46	-	Normal	-
Mar 8, 1974	10	50	Moist	Normal	-
Mar 13, 1974	11	55	Moist	Normal	Tens.= 32 on Feb 28, 48 Mar 4, 45 Mar 6, 12 Mar 13, 22 Mar 15
Mar 20, 1974	13	60	Dry	Normal	-

PLOT NO. 35 CARROT

MARCH 20, 1974



GROUND LEVEL



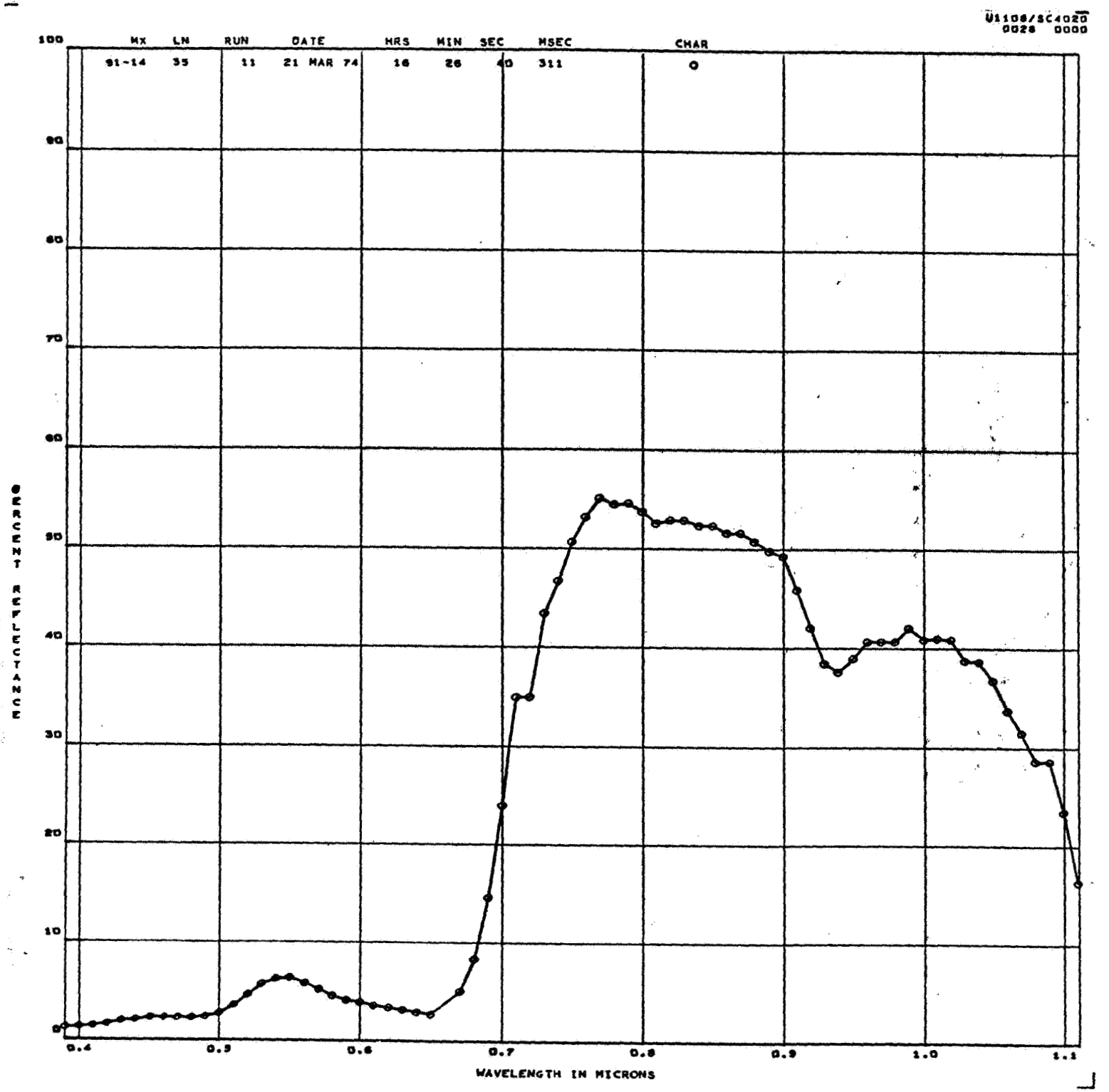
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 35

CARROT

SPECTROMETER SIGNATURE



PLOT NO. 36 CHICK PEAS

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Dec 4, 1973	Planted 2 rows on 40" beds with 12" spacing
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 26, 1973	First emergence
Jan 7, 1974	Poor stand
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Transplanted for proper stand - Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 36 CHICK PEAS

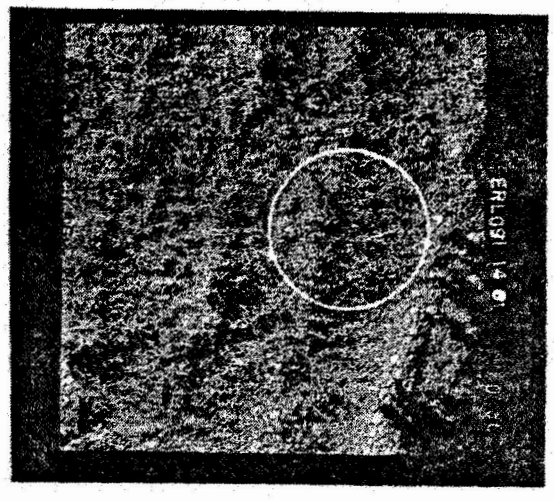
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	-	-	Moist 1" down	-	Not emerged
Jan 3, 1974	1	1	Moist 1.5" down	Normal	-
Jan 10, 1974	2.5	3	Moist .5" down	Normal	Poor stand
Jan 14, 1974	4	6	Wet	Normal	Transplanted for good stand
Jan 25, 1974	6	8	Moist 3" down	Normal	Salt on rows - Jan 21, 1974
Jan 30, 1974	6	7	Moist 2" down	Normal	-
Feb 7, 1974	7	20	Dry	Normal	No weeds
Feb 14, 1974	9	20	Dry	Normal	Poor stand
Feb 22, 1974	11	21	-	Normal	Small white - blossoms
Feb 28, 1974	11	23	-	Normal	Small white - blossoms
Mar 8, 1974	14	30	Moist	Normal	Small white - blossoms
Mar 13, 1974	14	40	Moist	Normal	Small white - blossoms and pods
Mar 20, 1974	15	60	Dry	Normal	-

PLOT NO. 36 CHICK PEAS

MARCH 20, 1974

GROUND LEVEL



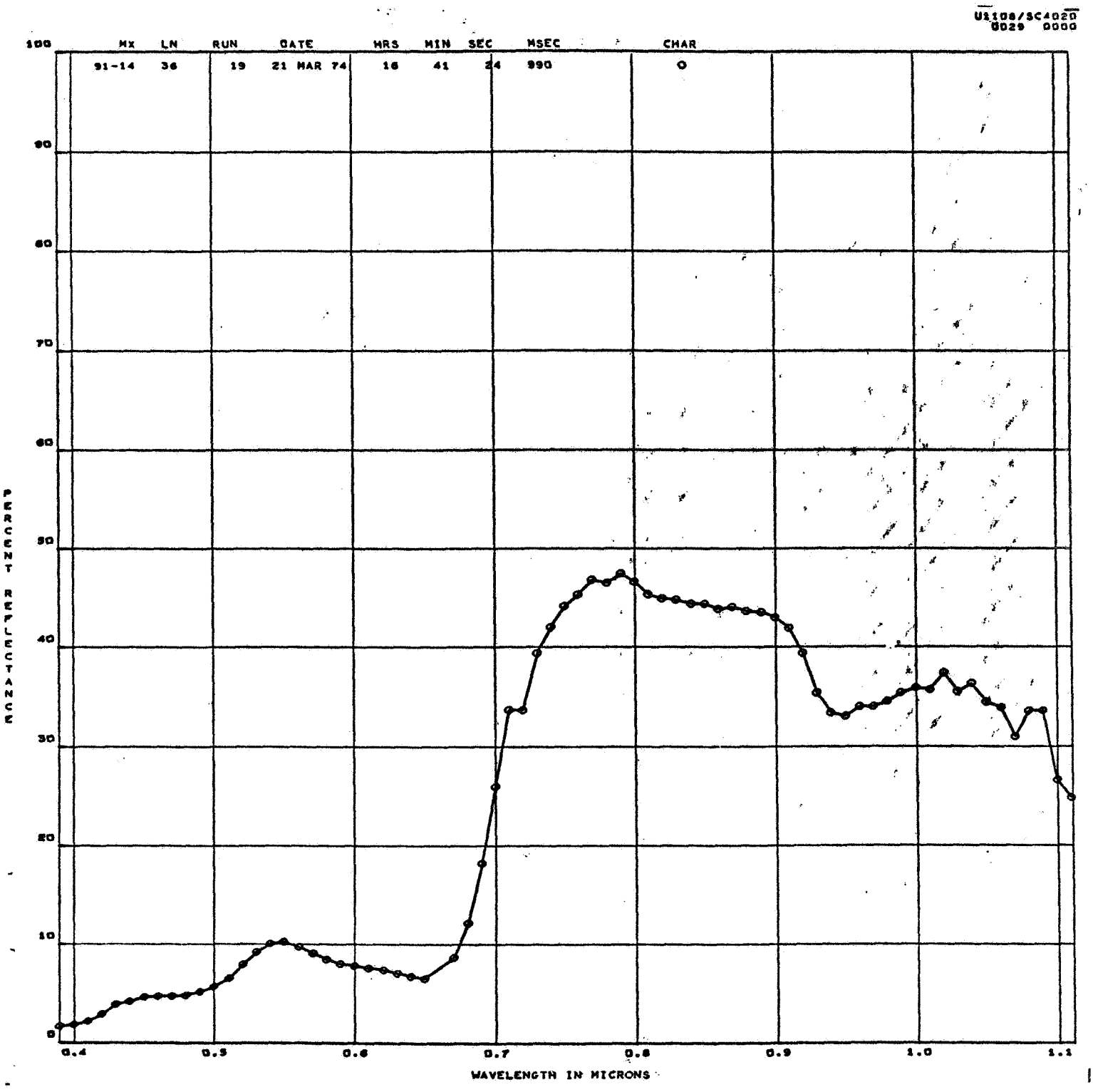
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 36

CHICK PEAS

SPECTROMETER SIGNATURE



PLOT NO. 37

POPPY-2
(Acquisition No. M-89)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted rows on 40" beds with 12" spacing and 9" spacing in drill
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 9"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 37

POPPY-2
(Acquisition No. M-89)

GROUND TRUTH DATA

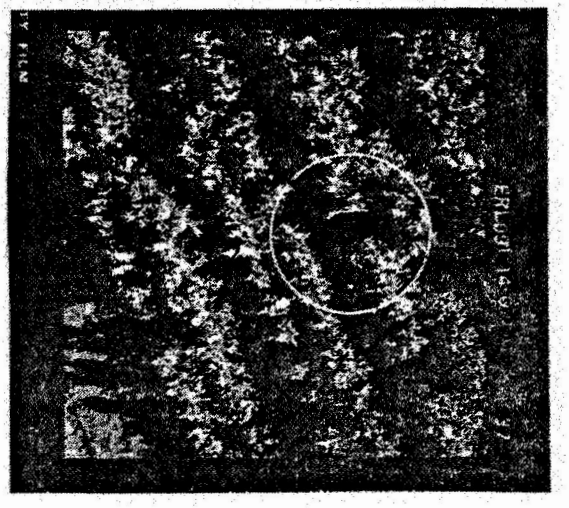
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	1	1	Moist 1" down	Wilted	Thinned Dec 19
Jan 3, 1974	1.5	2	Moist 1.5" down	Normal	-
Jan 10, 1974	2	10	Moist .5" down	Normal	-
Jan 14, 1974	3	22	Wet	Normal	-
Jan 25, 1974	4	15	Moist 3" down	Normal	5% weeds Salt on rows - Jan 21, 1974
Jan 30, 1974	6	15	Moist 2" down	Normal	-
Feb 7, 1974	7	30	Dry	Normal	No weeds
Feb 14, 1974	9	33	Dry	Normal	-
Feb 22, 1974	10	46	-	Normal	-
Feb 28, 1974	14	52	-	Normal	-
Mar 8, 1974	18	60	Moist	Normal	-
Mar 13, 1974	30	85	Moist	Normal	-
Mar 20, 1974	39	88	Dry	Normal	White blossoms

PLOT NO. 37

POPPY-2

MARCH 20, 1974

GROUND LEVEL



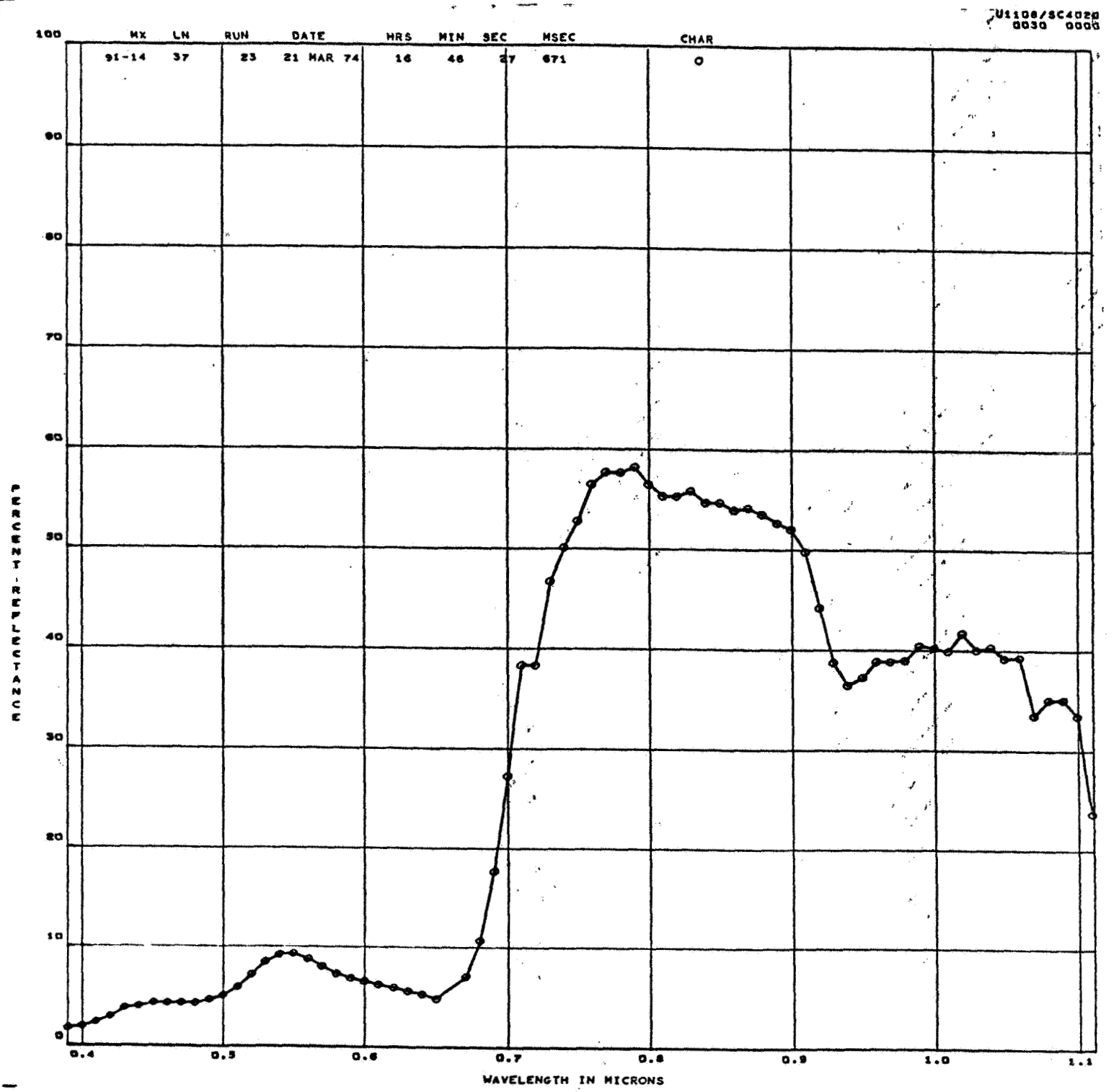
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 37

POPPY-2

SPECTROMETER SIGNATURE



PLOT NO. 38

POPPY-4
(Mixture of 1, 2, 3)

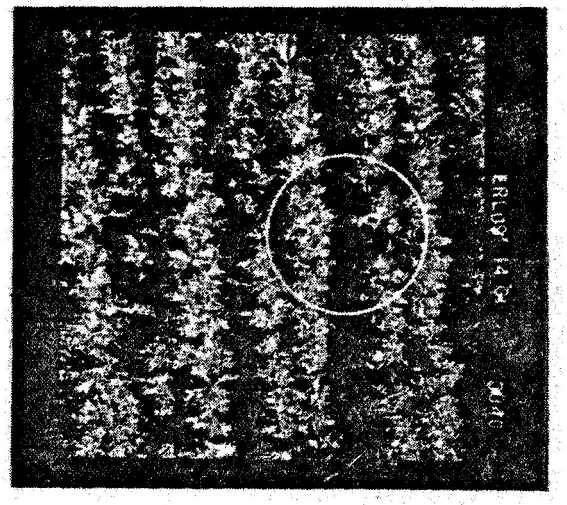
CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 7, 1973	Planted 2 rows on 40" beds with 12" spacing and 9" spacing in drill
Nov 9, 1973	Irrigated
Nov 13, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned to 9"
Dec 26, 1973	Cultivated
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 11, 1974	Sprayed with phosdrin

PLOT NO. 38 POPPY-4

MARCH 20, 1974

GROUND LEVEL



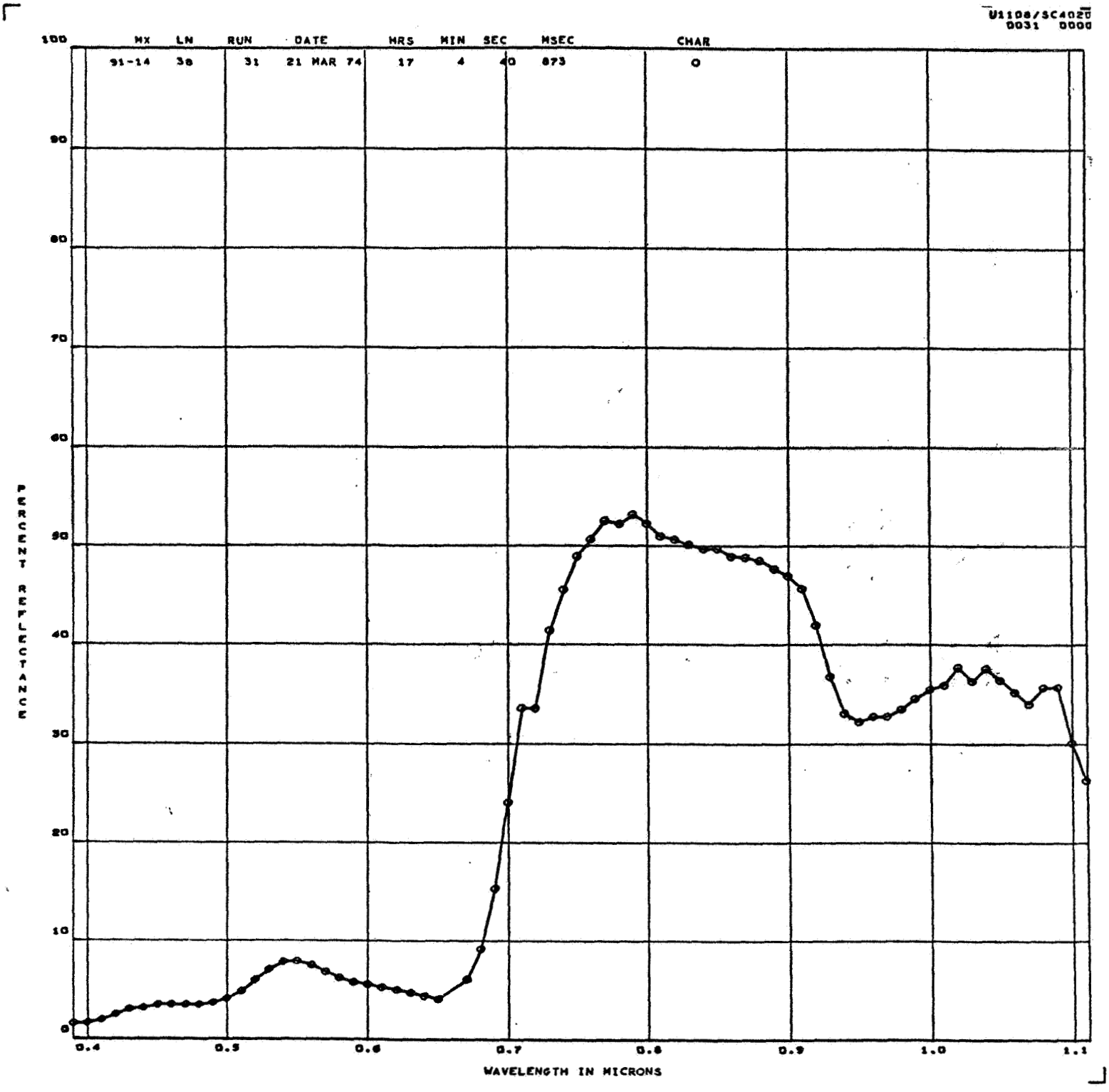
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 38

POPPY-4

SPECTROMETER SIGNATURE



PLOT NO. 39

BARE GROUND
(DRY)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 9, 1973	Irrigated
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 26, 1973	Cultivated
Jan 15, 1974	Irrigated
Jan 28, 1974	Hoed weeds
Jan 29, 1974	Disced fallow portion
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated

PLOT NO. 39

BARE GROUND
(Dry)

GROUND TRUTH DATA

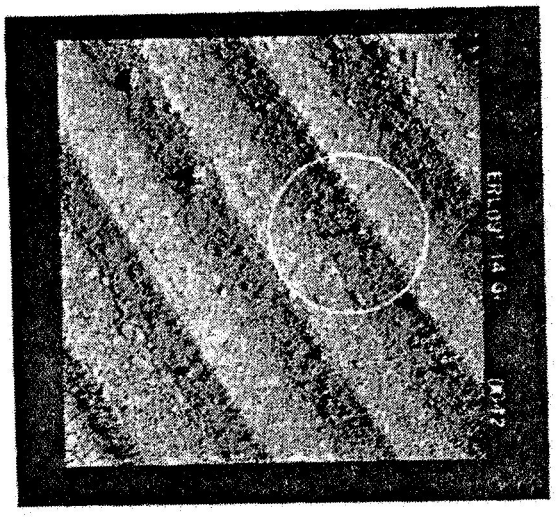
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Dec 18, 1973	-	-	Moist 1" down	-	-
Jan 3, 1974	-	-	Dry	-	No weeds
Jan 10, 1974	-	0	Moist .5" down	-	-
Jan 14, 1974	-	0	Dry	-	Not irrigated or cultivated
Jan 25, 1974	-	0	Moist 3" down	-	No weeds Salt on rows - Jan 21, 1974
Jan 30, 1974	-	-	Dry	-	-
Feb 7, 1974	-	-	-	-	No weeds
Feb 14, 1974	-	-	Dry	-	-
Feb 22, 1974	-	0	-	-	-
Feb 28, 1974	-	-	-	-	-
Mar 1, 1974	-	-	-	-	Plot relocated
Mar 13, 1974	-	-	Dry -	-	-
Mar 20, 1974	-	-	Dry	-	-

PLOT NO. 39

BARE GROUND
(DRY)

MARCH 20, 1974

GROUND LEVEL



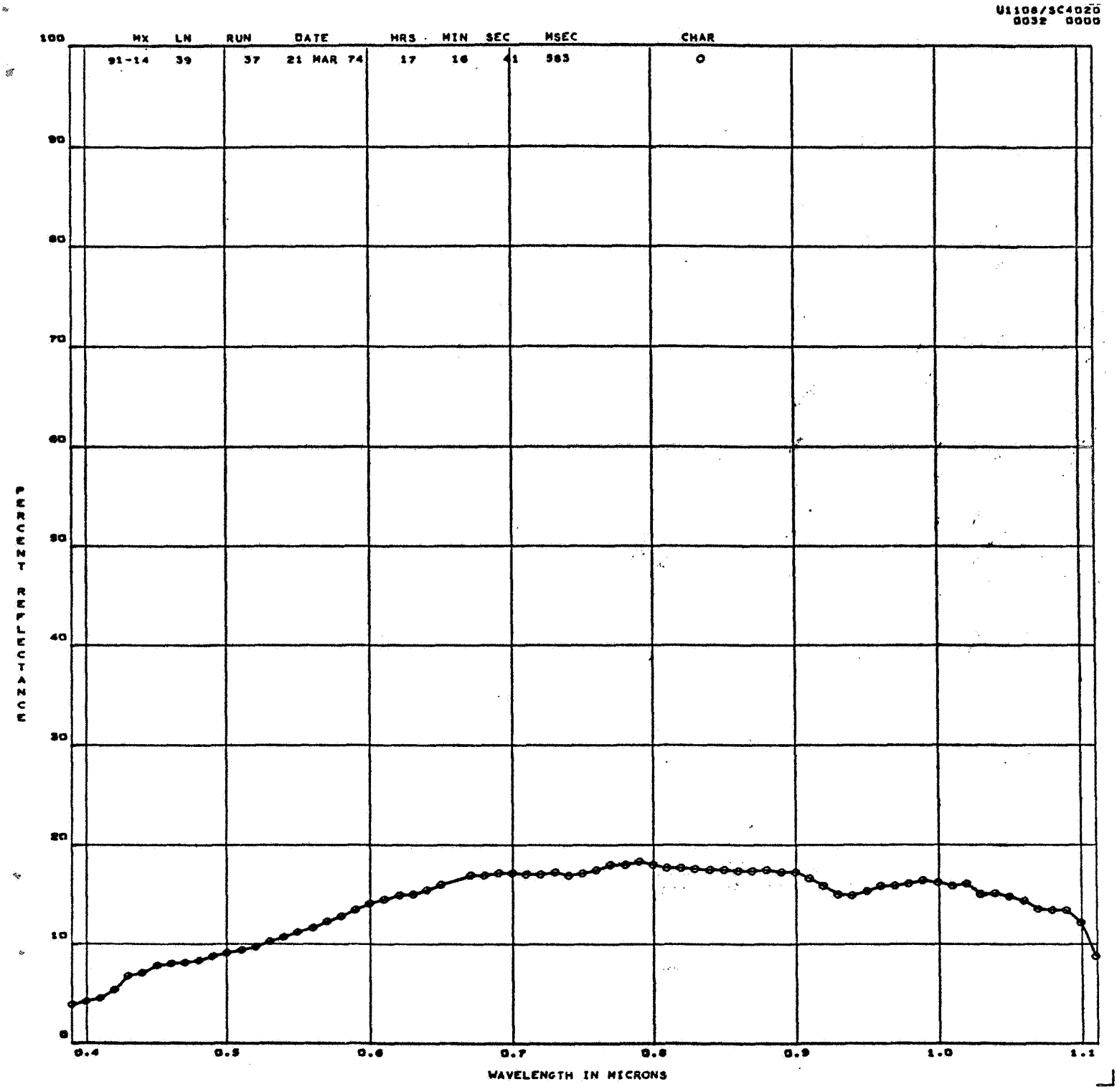
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 39

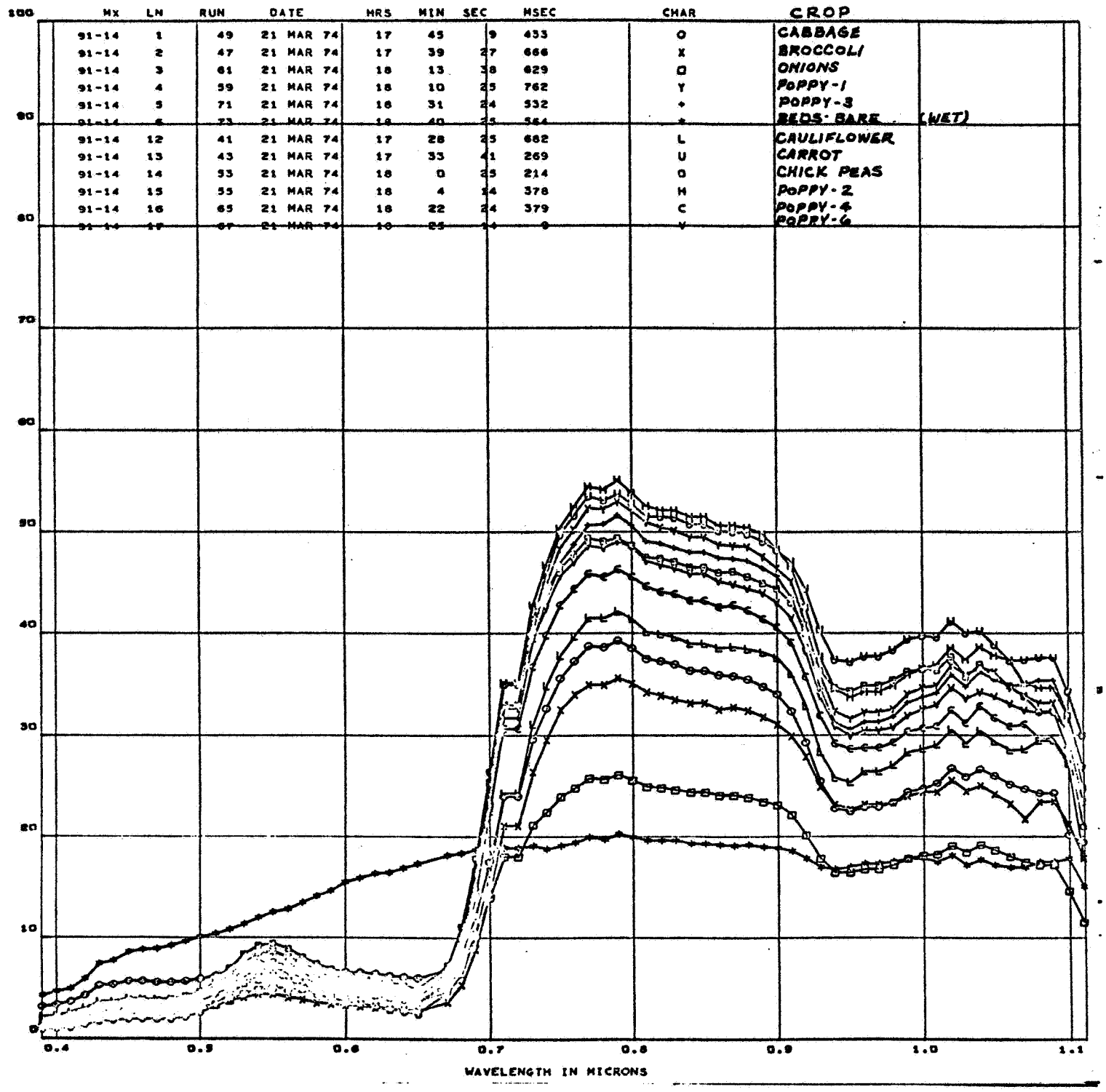
BARE GROUND
(DRY)

SPECTROMETER SIGNATURE



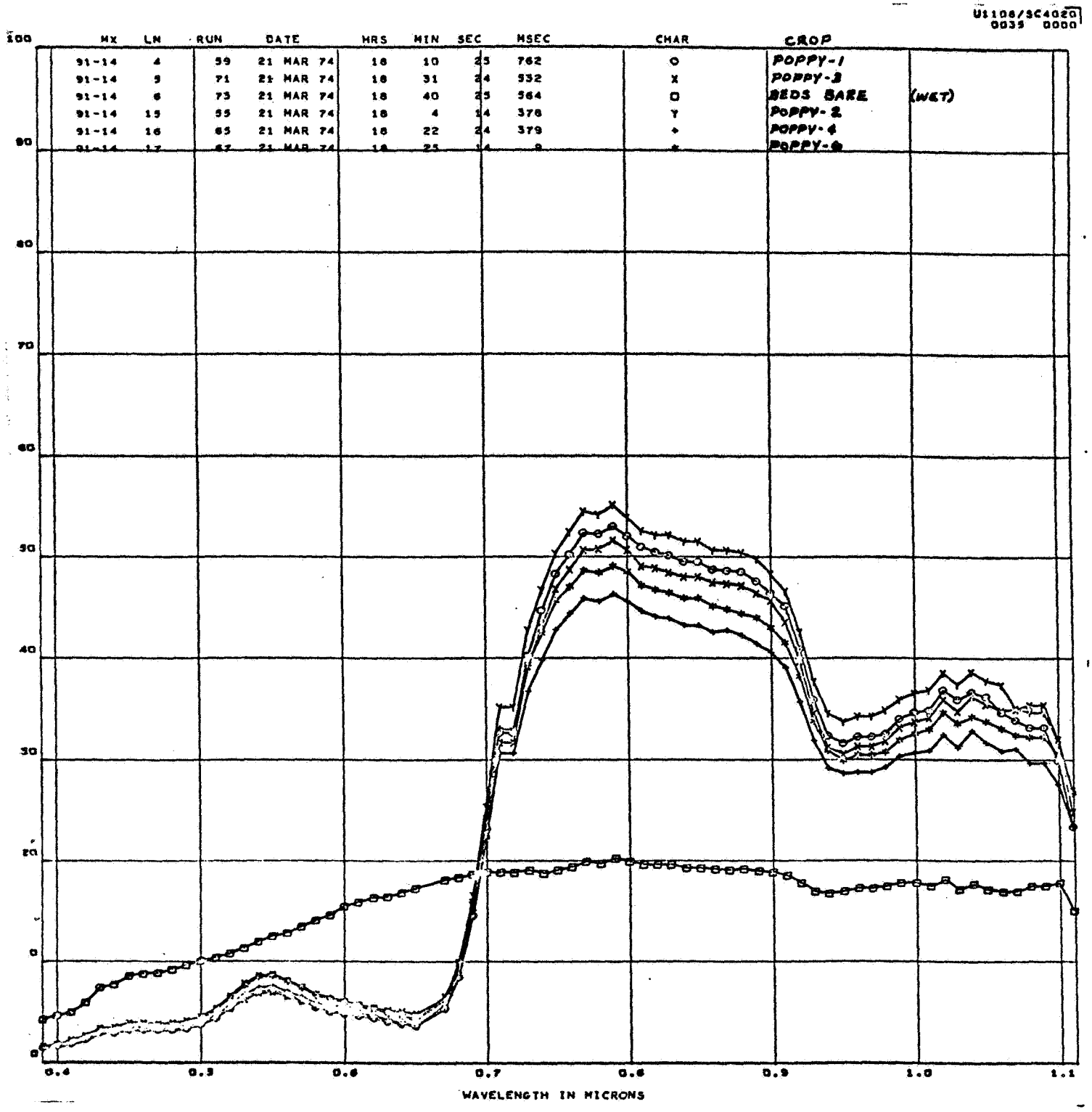
MULTIPLE SPECTROMETER CURVES

MARCH 21, 1974



MULTIPLE SPECTROMETER CURVES

MARCH 21, 1974

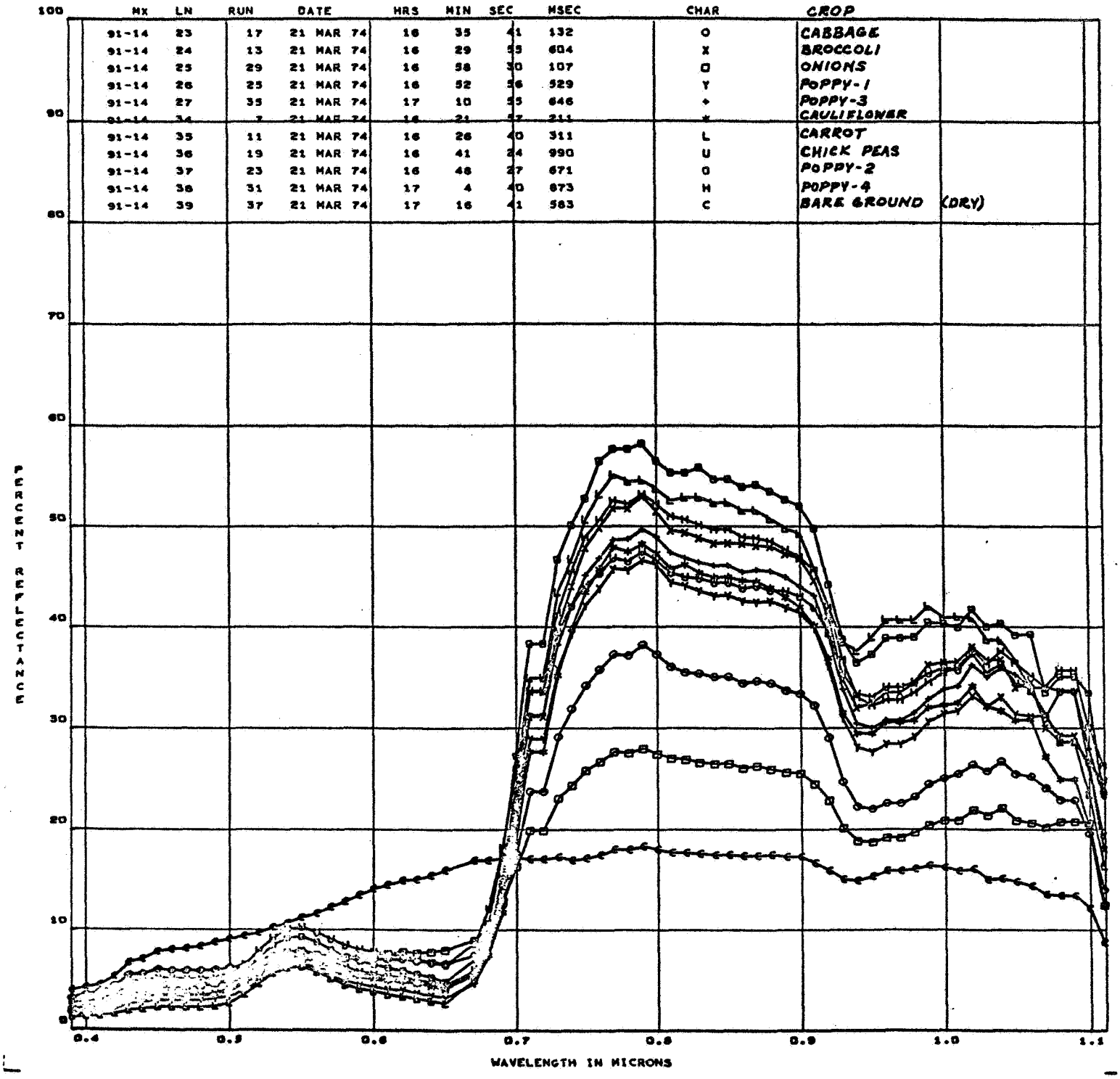


MULTIPLE SPECTROMETER CURVES

MARCH 21, 1974

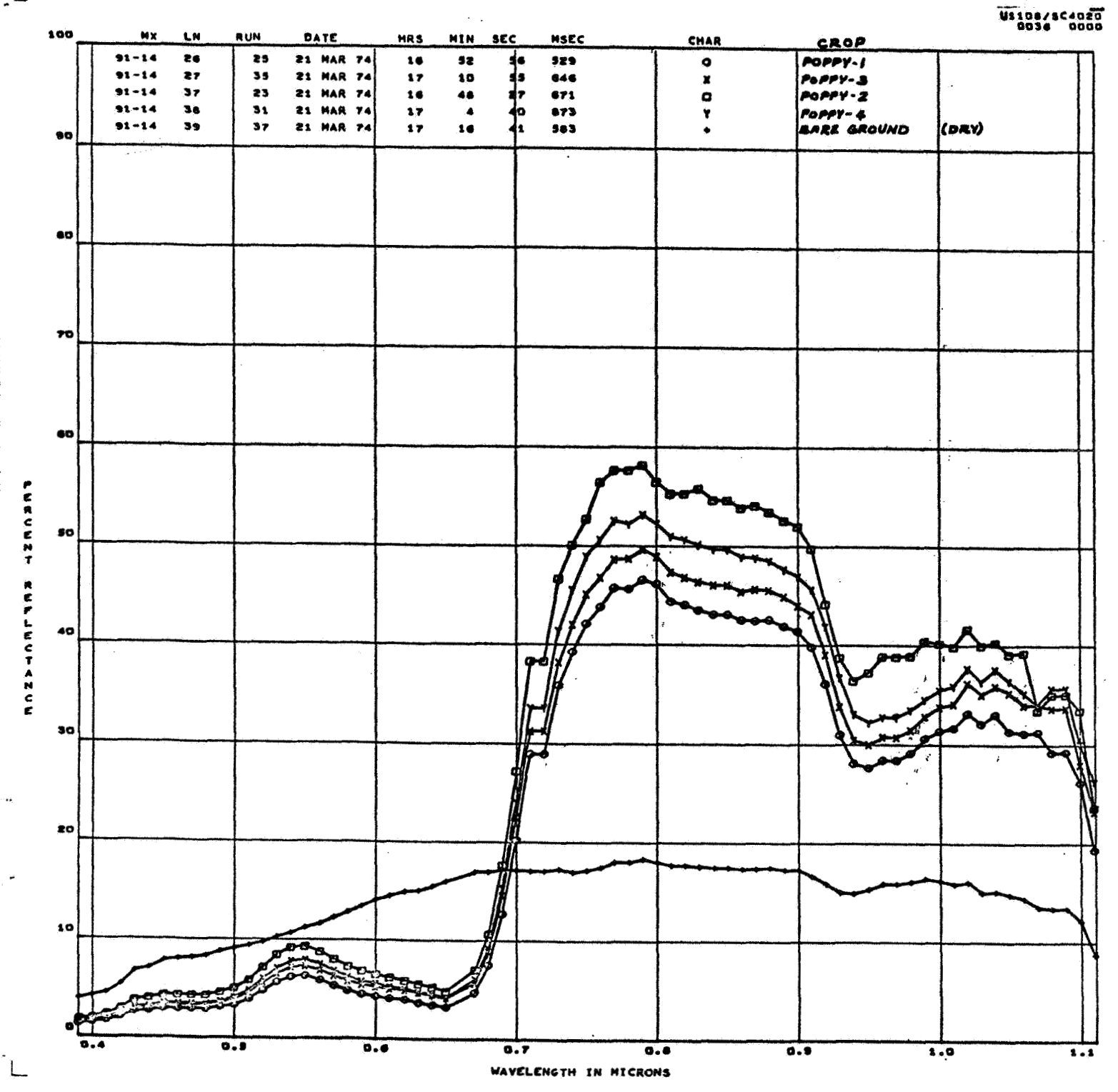
U1108/SC4020
0034 0000

MX	LN	RUN	DATE	HRS	MIN	SEC	MSEC	CHAR	CROP
91-14	23	17	21 MAR 74	16	35	41	132	O	CABBAGE
91-14	24	13	21 MAR 74	16	29	55	604	X	BROCCOLI
91-14	25	29	21 MAR 74	16	58	30	107	□	ONIONS
91-14	26	25	21 MAR 74	16	52	56	529	Y	POPPY-1
91-14	27	35	21 MAR 74	17	10	55	646	+	POPPY-3
91-14	34	7	21 MAR 74	16	21	57	211	*	CAULIFLOWER
91-14	35	11	21 MAR 74	16	26	40	311	L	CARROT
91-14	36	19	21 MAR 74	16	41	24	990	U	CHICK PEAS
91-14	37	23	21 MAR 74	16	48	27	671	0	POPPY-2
91-14	38	31	21 MAR 74	17	4	40	673	H	POPPY-4
91-14	39	37	21 MAR 74	17	16	41	583	C	BARE GROUND (DRY)



MULTIPLE SPECTROMETER CURVES

MARCH 21, 1974



PLOT NO. 51

POPPY-1
(Acquisition No. B-40-6-3)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac
Nov 11, 1973	Irrigated
Nov 13, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 19, 1973	Thinned
Dec 27, 1973	Cultivated
Jan 9, 1974	Hoed weeds
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 14, 1974	Thinned double plants - Irrigated
Jan 28, 1974	Hoed weeds
Jan 31, 1974	6 cm test plants N - S too close, E - W 13", height 7" 12 cm N - S too close, E - W 11", height 4.5"
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 8, 1974	Pumped some water off plot because of over irrigation

PLOT NO. 51

POPPY-1
(Acquisition No. B-40-6-3)
(6cm spacing)

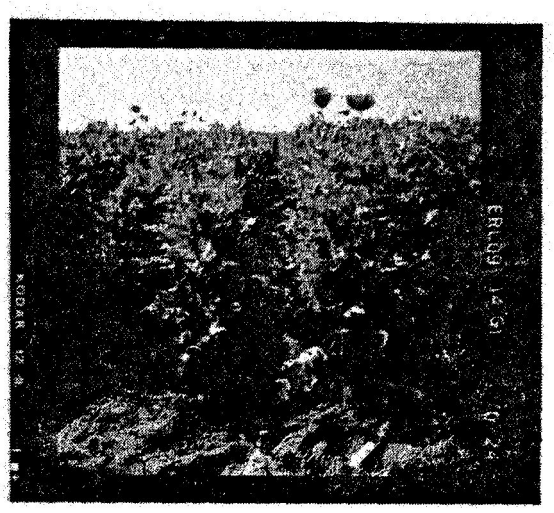
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Jan 3, 1974	1	3	Moist 1.5"down	Normal	-
Jan 10, 1974	2	-	Moist .5" down	Normal	-
Jan 14, 1974	3	15	Wet	Normal	-
Jan 25, 1974	5	25	Moist 1" down	Normal	No weeds Salt on rows - Jan 21, 1974
Jan 30, 1974	7	33	Moist 2" down	Normal	-
Feb 7, 1974	11	33	Dry	Normal	No weeds
Feb 14, 1974	12	38	Dry	Normal	-
Feb 22, 1974	16	51	-	Normal	-
Feb 28, 1974	18.5	71	-	Normal	-
Mar 8, 1974	24	79	Moist	Normal	-
Mar 13, 1974	36	85	Moist	Normal	White blossoms
Mar 20, 1974	42	95	-	Normal	Many purple blossoms

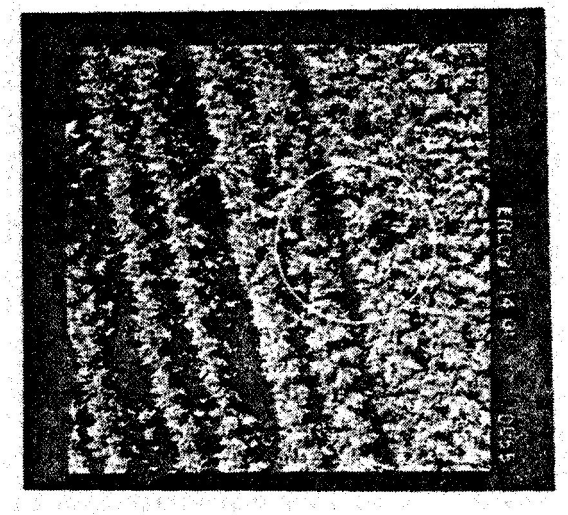
PLOT NO. 51

POPPY-1

MARCH 20, 1974



GROUND LEVEL



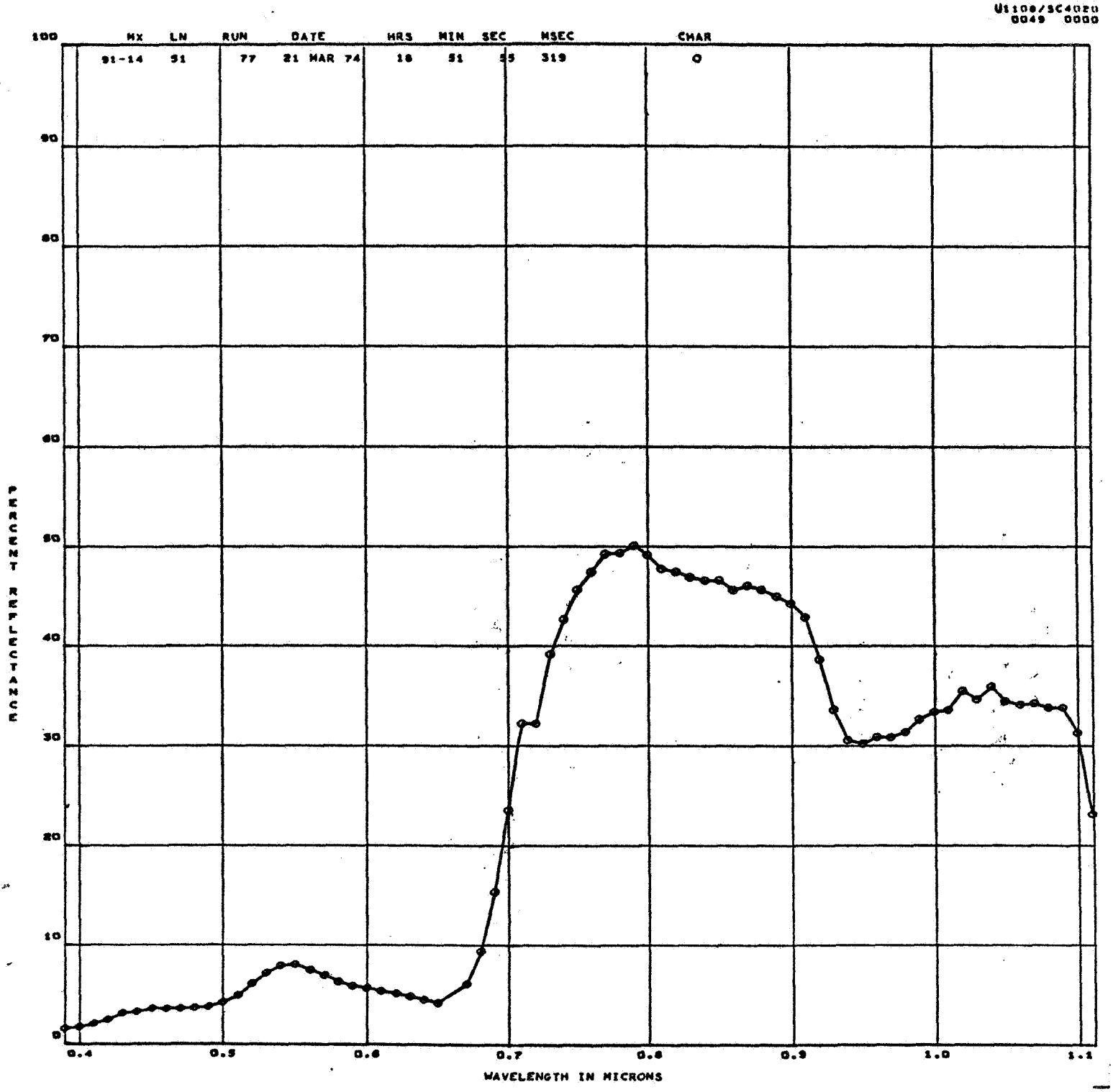
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 51

POPPY-1

SPECTROMETER SIGNATURE



PLOT NO. 52

POPPY-2
(Acquisition No. M-89)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac - Planted
Nov 11, 1973	Irrigated
Nov 13, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 17, 1973	Thinned
Dec 27, 1973	Cultivated
Jan 9, 1974	Hoed weeds
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 14, 1974	Thinned double plants - Irrigated
Jan 28, 1974	Hoed weeds
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 8, 1974	Pumped some water off plot because of over irrigation

PLOT NO. 52

POPPY-2
(Acquisition No. M-89)
(18 cm spacing)

GROUND TRUTH DATA

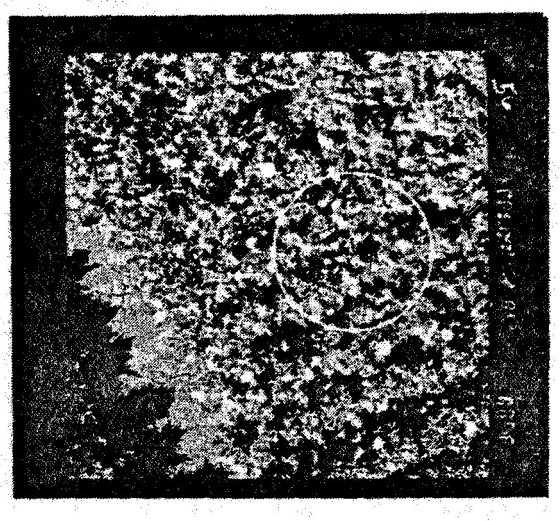
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Jan 3, 1974	1.5	5	Moist 1.5"down	Normal	-
Jan 10, 1974	3	13	Moist .5"down	Normal	-
Jan 14, 1974	3.5	20	Wet	Normal	-
Jan 25, 1974	6	33	Moist 1" down	Normal	No weeds Salt on rows Jan 21, 1974
Jan 30, 1974	7	35	Moist 2" down	Normal	-
Feb 7, 1974	12	50	Dry	Normal	No weeds
Feb 14, 1974	16	60	Dry	Normal	-
Feb 22, 1974	19	75	-	Normal	-
Feb 28, 1974	21	87	-	Normal	-
Mar 8, 1974	28	94	Moist	Normal	Many buds
Mar 13, 1974	39	100	Moist	Normal	White blossoms
Mar 20, 1974	51	100	-	Normal	Many white - blossoms

PLOT NO. 52

POPPY-2

MARCH 20, 1974

GROUND LEVEL



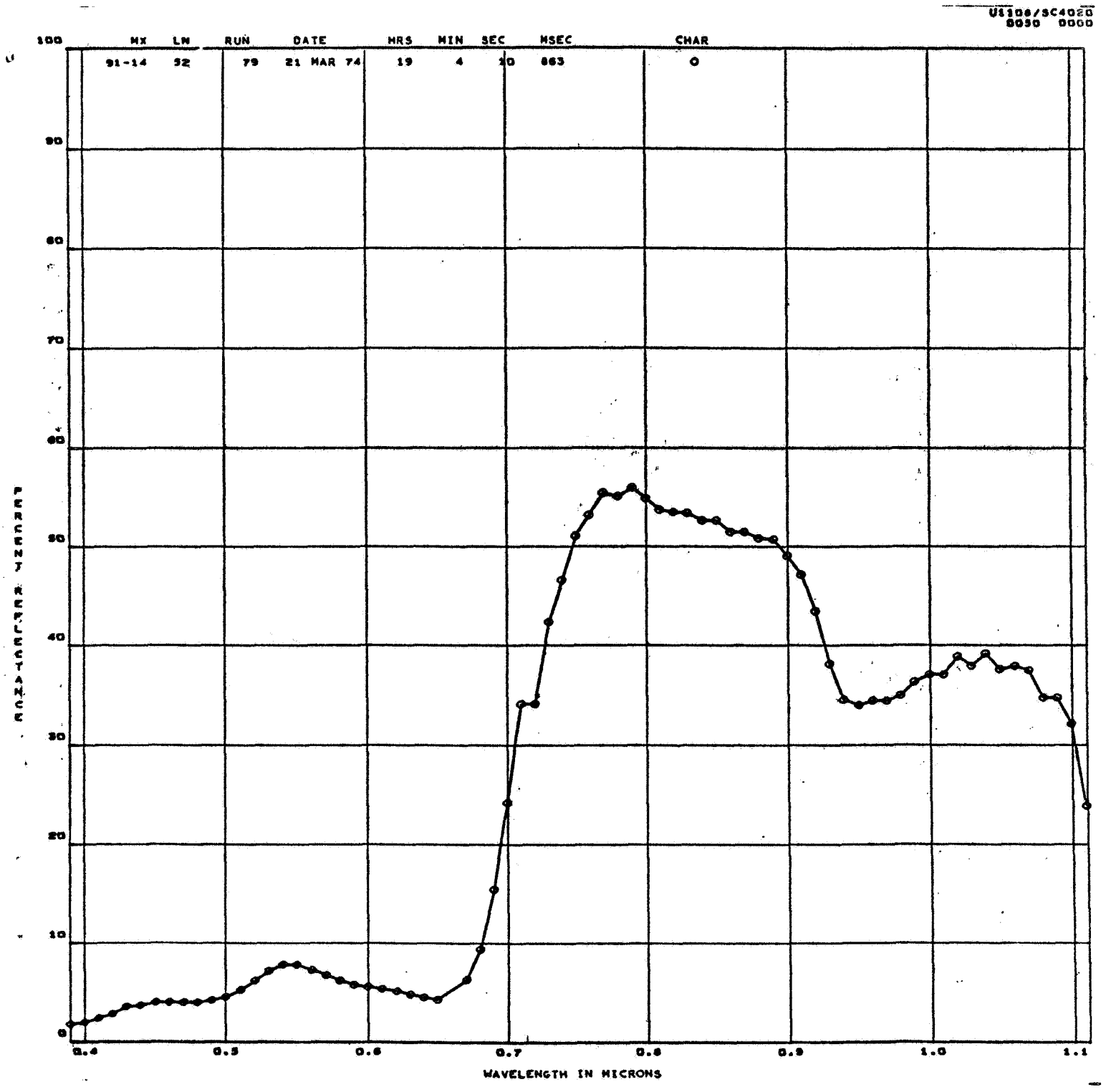
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 52

POPPY- 2

SPECTROMETER SIGNATURE



PLOT NO. 53

POPPY-2
(Acquisition No. M-89)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac - Planted
Nov 11, 1973	Irrigated
Nov 13, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 19, 1973	Thinned
Dec 27, 1973	Cultivated
Jan 9, 1974	Hoed weeds
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 14, 1974	Thinned double plants - Irrigated
Jan 28, 1974	Hoed weeds
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 8, 1974	Pumped some water off plot because of over irrigation

PLOT NO. 53

POPPY-2
(Acquisition No. M-89)
(6cm spacing)

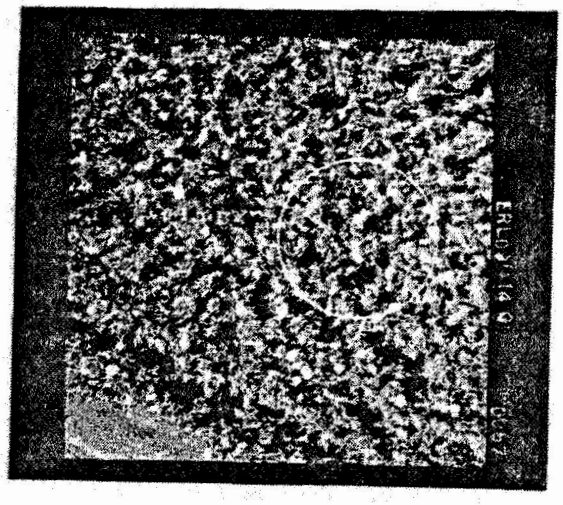
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Jan 3, 1974	1.5-2.5	10	Moist 1.5"down	Normal	-
Jan 10, 1974	3	15	Moist .5"down	Normal	-
Jan 14, 1974	4	25	Wet	Normal	-
Jan 25, 1974	8	35	Moist 1" down	Normal	No weeds Salt on rows - Jan 21, 1974
Jan 30, 1974	9	37	Moist 2" down	Normal	-
Feb 7, 1974	14	60	Dry	Normal	No weeds
Feb 14, 1974	15	60	Dry	Normal	-
Feb 22, 1974	20	85	-	Normal	-
Feb 28, 1974	28	87	-	Normal	-
Mar 8, 1974	28	94	Moist	Normal	Many buds
Mar 13, 1974	41	100	Moist	Normal	White blossoms
Mar 20, 1974	51	100	-	Normal	Many white - blossoms

PLOT NO. 53 POPPY-2

MARCH 20, 1974

GROUND LEVEL



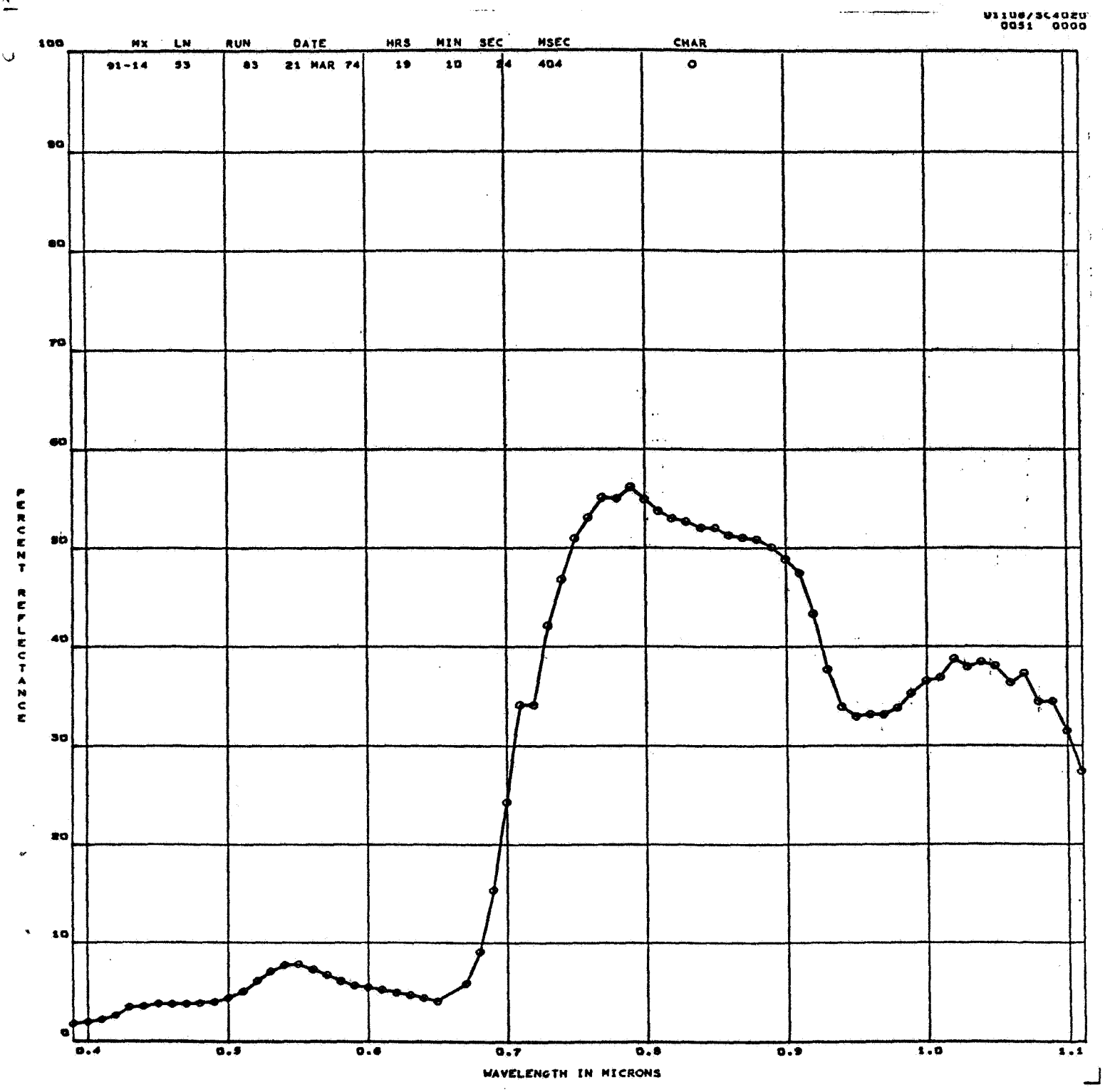
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 53

POPPY-2

SPECTROMETER SIGNATURE



PLOT NO. 54

POPPY-2
(Acquisition No. M-89)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N/Ac - Planted
Nov 11, 1973	Irrigated
Nov 13, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 21, 1973	Thinned
Dec 27, 1973	Cultivated
Jan 9, 1974	Hoed weeds
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 14, 1974	Thinned double plants - Irrigated
Jan 28, 1974	Hoed weeds
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 8, 1974	Pumped some water off plot because of over irrigation

PLOT NO. 54

POPPY-2
(Acquisition No. M-89)
(12 cm spacing)

GROUND TRUTH DATA

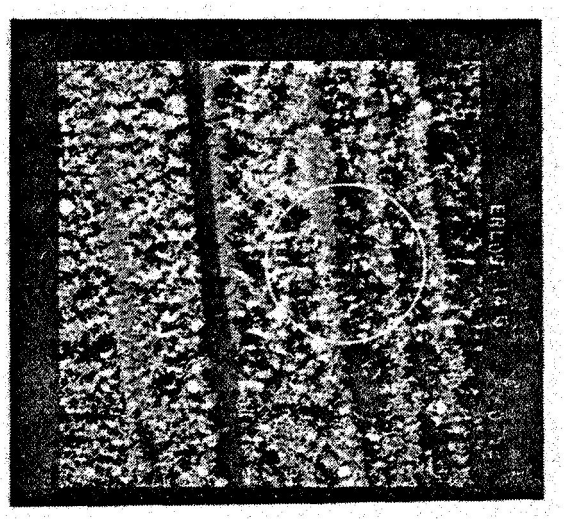
DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Jan 3, 1974	1	5	Moist 1.5"down	Normal	-
Jan 10, 1974	2	10	Moist .5" down	Normal	-
Jan 14, 1974	3	15	Wet	Normal	-
Jan 25, 1974	4	20	Moist 1" down	Normal	No weeds Salt on rows - Jan 21, 1974
Jan 30, 1974	6	23	Moist 2" down	Normal	-
Feb 7, 1974	10	40	Dry	Normal	No weeds
Feb 14, 1974	11	45	Dry	Normal	-
Feb 22, 1974	13	50	-	Normal	-
Feb 28, 1974	14.5	71	-	Normal	-
Mar 8, 1974	19	85	Moist	Normal	-
Mar 13, 1974	32	95	Moist	Normal	White blossoms
Mar 20, 1974	39	90	-	Normal	Many white - blossoms

PLOT NO. 54

POPPY-2

MARCH 20, 1974

GROUND LEVEL



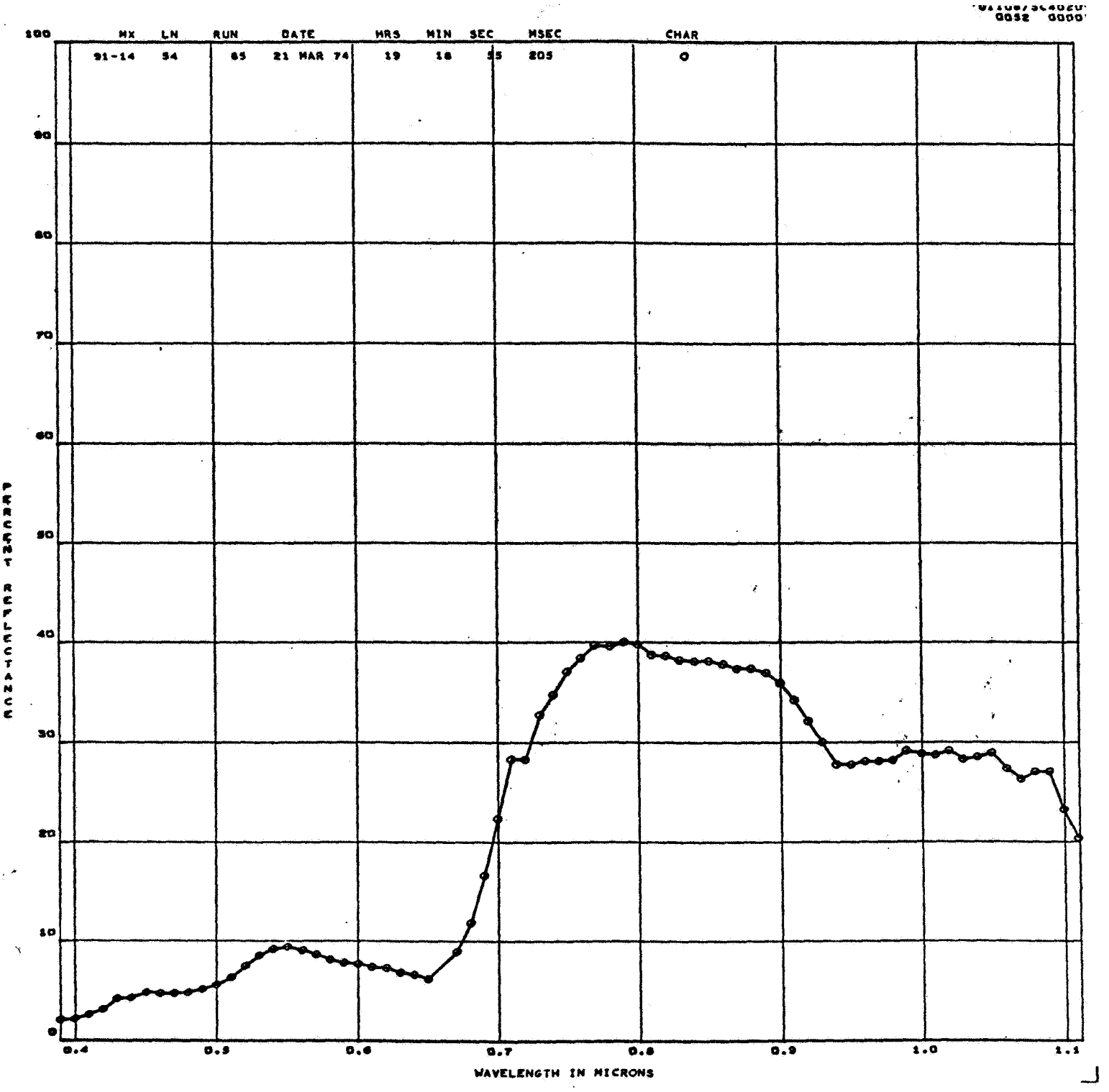
BORESIGHT

Circle represents spectrometer signature

PLOT NO. 54

POPPY-2

SPECTROMETER SIGNATURE



PLOT NO. 55

POPPY-1
(Acquisition No. B-40-6-3)

CROP HISTORY

Nov 6, 1973	Fertilized with 50 lbs N Ac - Planted
Nov 11, 1973	Irrigated
Nov 13, 1973	First emergence
Nov 15, 1973	Up to a stand
Dec 7, 1973	Fertilized with 50 lbs N/Ac - Irrigated
Dec 27, 1973	Thinned - Cultivated
Jan 9, 1974	Hoed weeds
Jan 11, 1974	Sidedressed with 50 lbs N/Ac
Jan 14, 1974	Thinned double plants - Irrigated
Jan 28, 1974	Hoed weeds
Jan 31, 1974	18 cm test plants N - S 12", E - W 14.5", height 5"
Feb 14, 1974	Furrows cultivated
Feb 15, 1974	Irrigated
Mar 7, 1974	Irrigated
Mar 8, 1974	Pumped some water off plot because of over irrigation

PLOT NO. 55

POPPY-1
(Acquisition No. R-40-6-1)
(18 cm spacing)

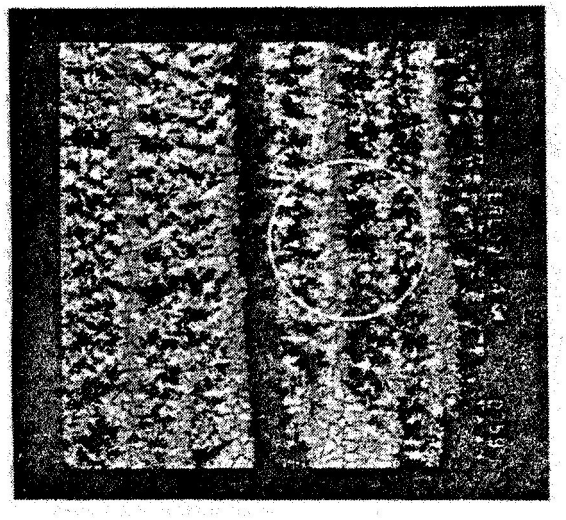
GROUND TRUTH DATA

DATE	CROP HEIGHT (inches)	GROUND COVER %	GROUND SURFACE CONDITIONS	CROP CONDITION	COMMENTS
Jan 3, 1974	1	3	Moist 1.5"down	Normal	-
Jan 10, 1974	2	12	Moist .5" down	Normal	-
Jan 14, 1974	3	15	Wet	Normal	-
Jan 25, 1974	4	20	Moist 1" down	Normal	No weeds Salt on rows - Jan 21, 1974
Jan 30, 1974	6	20	Moist 2" down	Normal	-
Feb 7, 1974	7	30	Dry	Normal	No weeds
Feb 14, 1974	10	40	Dry	Normal	-
Feb 22, 1974	12	48	-	Normal	-
Feb 28, 1974	13	68	-	Normal	-
Mar 8, 1974	18	80	Moist	Normal	-
Mar 13, 1974	33	95	Moist	Normal	White blossoms
Mar 20, 1974	39	90	-	Normal	Many white - blossoms

PLOT NO. 55 POPPY-1

MARCH 20, 1974

GROUND LEVEL



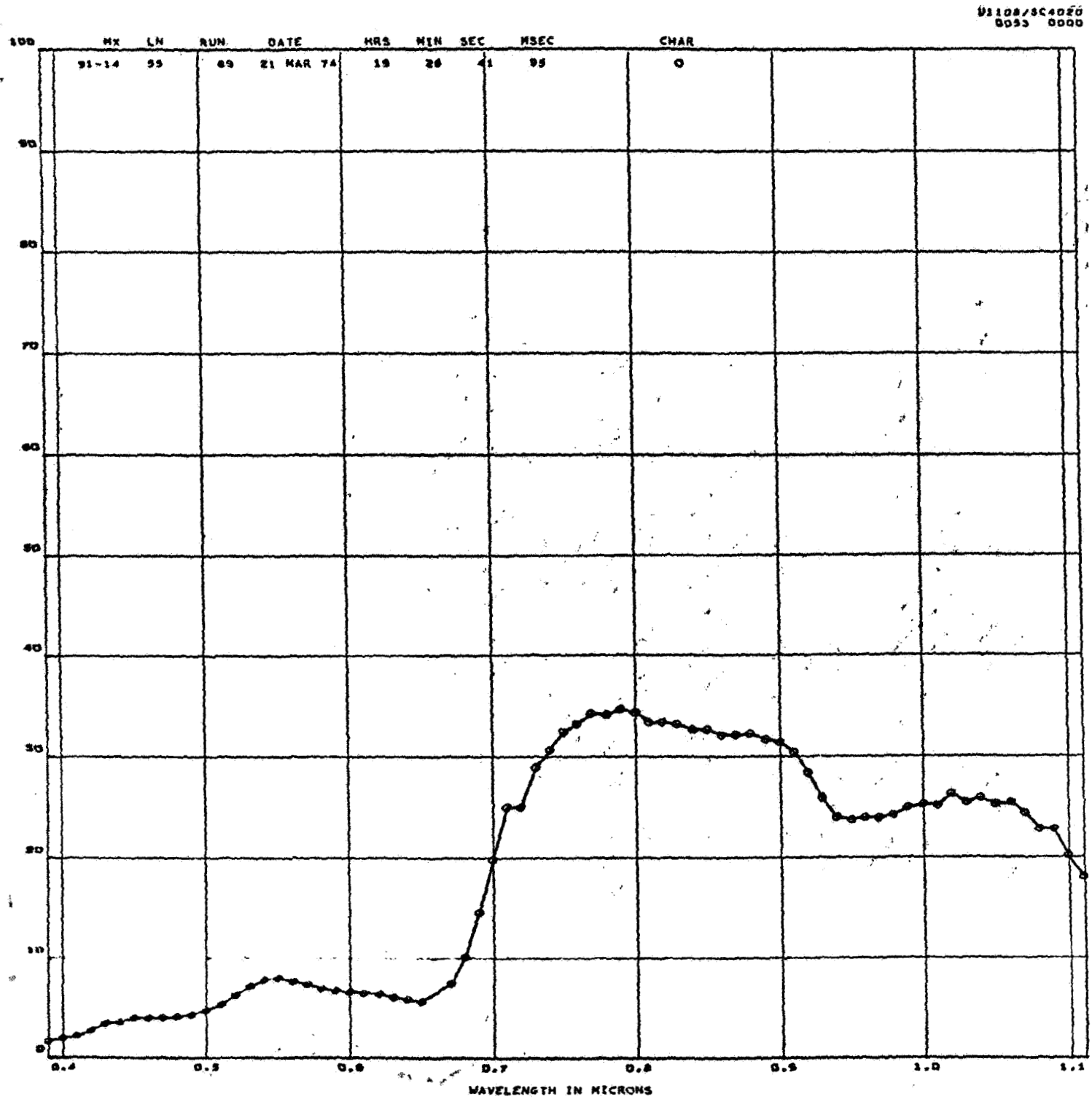
BORESIGHT

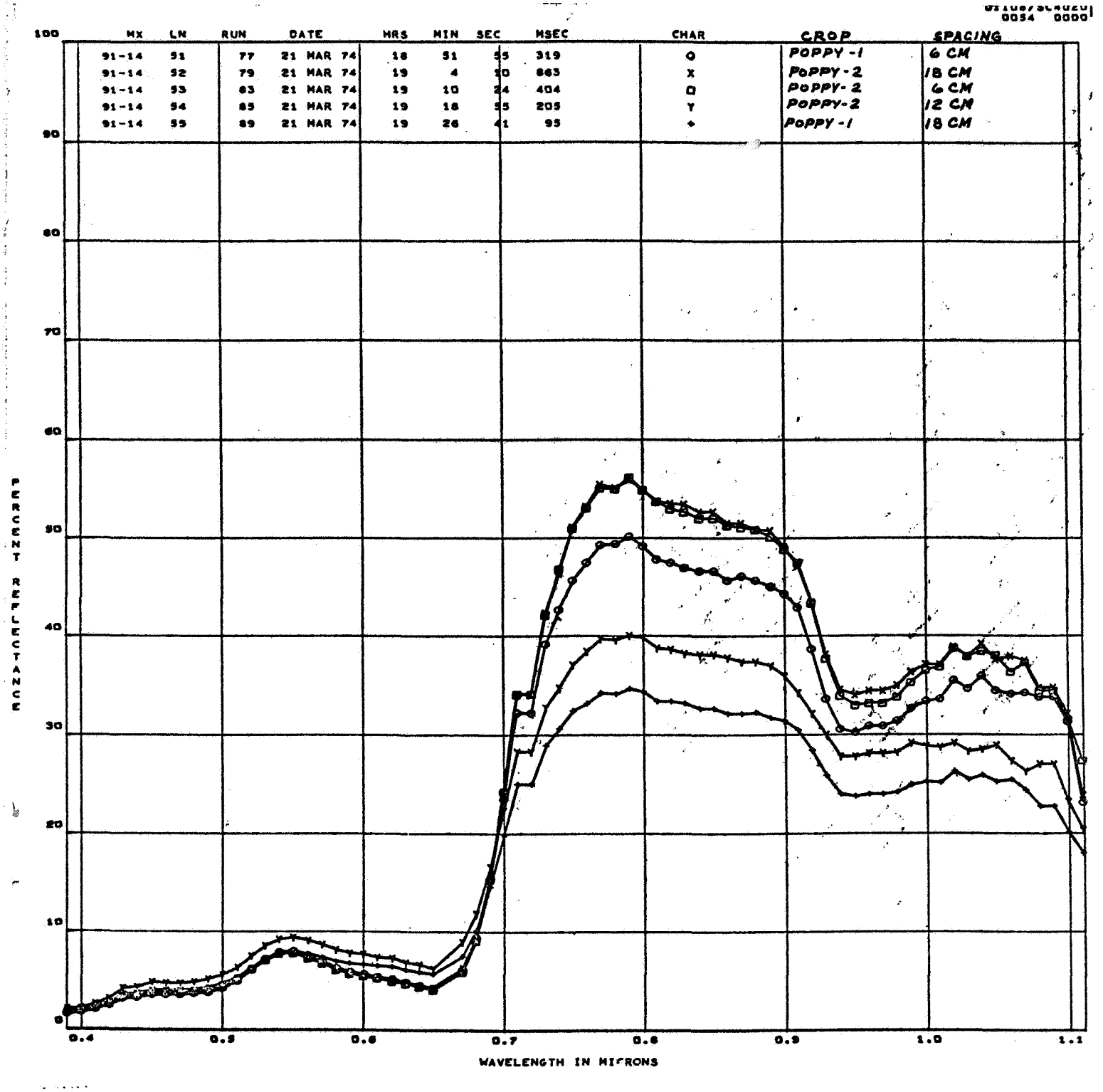
Circle represents spectrometer signature

PLOT NO. 55

POPPY - 1

SPECTROMETER SIGNATURE



MULTIPLE SPECTROMETER CURVES

MARCH 21, 1974